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Factors in the management of golf courses as illustrated by the study of a specific golf club

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FACTORS IN THE MANAGEMENT OF GOLF COURSES
AS ILLUSTRATED BY THE STUDY
OF A SPECIFIC GOLF CLUB

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FACTORS IN THE MANAGEMENT OF GOLF COURSES AS
ILLUSTRATED BY THE STUDY OF A SPECIFIC GOLF CLUB

Thesis submitted for the degree of
Master of Science

Massachusetts State College
Amherst, Massachusetts. 1936

Lawrence S. Dickinson

P R E F A C E

The Object of the Thesis.

The Objects of this thesis are:

1. To acquaint the reader with the important fact that the successful management of a golf course depends upon the business ability and scientific knowledge of the course manager or greenkeeper.
2. To show some of the specific factors that affect the problem of golf course management, and their relation to business and science.
3. To demonstrate a method for the study of the management of a golf club, and the presenting of recommendations for the improvement of the cultural conditions of the course.

To satisfy these objects the writer has made a study of a specific golf club and has written this thesis in the form of a professional report to the board of directors of the club.

The Club studied and the reasons for
its selection.

The club selected for this specific study is known as The Lake Placid Club, at Lake Placid in the Adirondocks, New York. For the requirements of this study it does not seem necessary to describe in detail the scope and activities of the club. The two following quotations from the club publication "Standards and Customs" explain its aim.

"Lake Placid Club is an all-year family resort with carefully developed standards of admission and life. Everything commonly desired by a family of high morals and social training is sought for its members and guests. Everything that would be considered harmful is carefully avoided. What is good for children and young people is good for adults, and what is likely to be harmful to the young should be avoided for the sake of adults and young alike."

"It is a haven for the discriminating."

The club members are truly cultured persons, and for the most part wealthy. The number of active members is 1100, and the average daily resident attendance during the golf season is 700 persons.

The Lake Placid Club was selected for this study because its golfing opportunities and problems offered a unique combination of the varied conditions found among the private clubs, as observed by the author in his personal study of golf clubs in Canada and in nearly every state of the Union.

FOREWORD

Although the rules of the game of golf are essentially the same as they were five centuries ago, player attitude and demands, together with commercial influences have brought about such a change in the game that there is a generally accepted distinction between "ancient" and "modern" golf. In America, the game was first played in 1858, and the period from 1888 to 1915 is now considered "ancient". "Modern" golf began in 1925.

This transition from the ancient to the modern has caused the game to completely emerge from the strictly pleasure class of games, and it is now a business, competing with other sports for the leisure time and money spent in recreation by the American people. Unfortunately in the management of golf clubs and the playing areas, the transition has been made without the steadying influence of historical and statistical data that well organized business uses to hold in check the radical, selfish, and shortsighted influences. Thus, there is an annual waste of several millions of dollars by golf clubs.

It is difficult for many senior golfers to believe that golf is a business because for them, it is still a game to be played leisurely, for sociability and exercise,

and under the best of conditions with little thought of cost in money or health of turf. The golfer of "boom day" training still fails to recognize the business, in spite of the severe lesson taught to many golf clubs by the general economic depression since 1930. This generation of golfers is now in the majority and dangerous to course maintenance and design, for at the first sign of economic recovery we find this class of golfers vociferously advising schemes and demanding cultural practices on the course that will repeat proven erroneous ways. No club with golfing interest is without such members, therefore, sound business management and strong leadership is necessary to overcome their influence. Fortunately, the junior golfer, when he thinks seriously of golf and the golf course, tolerates the restraints of good business principals, and is constructive with his criticisms.

In the management study of a specific golf course, the above facts must be recognized and their influence on the particular problem understood.

PRIVATE CLUB GOLFING IS A BUSINESS

Private golf courses are no longer maintained without consideration of the cost, which was divided among the club members at the end of the fiscal year. The maintenance cost is paid from a budgeted account or a definite per cent of the cash receipts, thus necessitating business management of the funds and definitely classifying golfing as a business.

The Lake Placid Club is in the business of golfing because its golfing plant is maintained from a budgeted account, the size of which is governed by the cash receipts to the club, and as golfing is considered a major attraction by the club management, golfing must therefore, pay for itself directly or indirectly from cash receipts. It must offer as "profit" or "dividend", added club pleasure, better golfing facilities, and greens fees at a minimum consistent with the quality of the golfing conditions produced. Future business and customers, must be attracted to the golf courses, and present day customers must be satisfied, to be retained and to influence the younger generation to continue to purchase their summer golf at the club.

Table Showing the Principal Divisions
of the Golfing Business at The Lake Placid Club,
and Their Close Relationship
to the Factors of a Manufacturing Business

1. Factory	The golf courses, with their natural and artificial physical and cultural condition.
2. Machinery	The architectural features of the course.
3. Tools	The mechanical equipment for maintenance of courses.
4. Laborers	The laborers on the golf courses.
5. Manager	The golf director and the two foremen.
6. Product	Enjoyable golfing at moderate cost. Very intangible.
7. Capacity	Excluding the practice course I estimate the maintenance capacity of the golf factory to be 320 rounds per day.

In making the estimate of the maintenance capacity of the courses, I have used data and studies made of golfing costs, and in particular the study made of the Banff Springs, Alberta, golf course.¹

Maintenance capacity means the number of rounds that can be played without affecting the standard maintenance routine and costs. If play is greater than

the maintenance capacity, the added cost increases very rapidly and must be met with an increase in the budget. Otherwise the extra cost is met by drawing from the reserve in the cultural and physical condition of the golf course, eventually resulting in a greatly inferior playing condition.

THE TYPE OF GOLF DESIRED AT THE LAKE PLACID CLUB

The Lake Placid Club community is unique in its membership and idealistic in its object. The members are of the highest type of citizen, people who are wisely discriminating in their recreational desires.

Physical recreation is taken in the most beneficial manner, leisurely, and in temperate amounts. There must never be undue excitement, and in golf a hurrying match would be frowned upon. Yet play must move without delay or undue inconvenience.

The club golfers vary greatly as to playing ability and golfing desires, but one factor is in common; all are accustomed to having "the best available."

The fact that golf has been played at the club

for thirty-five years must not be overlooked. Valuable golfing customs, and traditions have been formed to make golfing at the Lake Placid Club different from that at the home clubs. There is an increasing number of members who are comparing the club course with the home course. This indicates that the influence of the "boom day" and modern golfer will, in time, change the golfing at the Lake Placid Club.

The Golf Committee and the Golf Director have a very difficult task during the next few years to preserve valuable playing and social attributes and yet to modernize the golfing

SOURCE OF INFORMATION FOR A MANAGEMENT STUDY

The objective of a management study of a specific golf course, is a report with recommendations for the improvement of the cultural conditions of the turf, and for a more efficient management of the entire golf course. As the completeness of a management study is dependent upon contributed information, collected data, and personal observations; it is important that the

sources of information should be carefully selected.

To obtain information for this study of golf course maintenance, the writer spent two weeks (August 9 - 24, 1935) of intensive work in residence at the Lake Placid Club.

The information was obtained from four principal sources.

- I. Conversing with all staff members in the golf department, and with club golfers in order to obtain as much as possible of the valuable unrecorded data. From each person I talked with I received some bit of valuable information, particularly from Mr. Miller, Chairman, and other members of the golf committee; Mr. Deo B. Colburn, golf director; Mr. William Dowling, club house manager; Mr. James Searls, golf professional; Mr. Eric Vihlem, foreman; and Mr. Samuel Silts, foreman.
- II. Studying the vegetation on and about the golfing areas particularly on the tees, greens, fairways, and rough. Soil samples were taken from each of the putting greens, and from various other areas. A very careful study was made of the records of

golf course expenditures and receipts; the amount of play; the minutes of the Greens Committee meetings held during 1933 and 1934, and such records of cultural treatment as were available. All records were from the files of Mr. Colburn, golf director.

- III. A portion of three half days was spent at the actual playing of the game on the various courses, to determine the quality of golfing being produced. The player viewpoint must not be lost or submerged by the agrostologists concern for the health of the grass, or sacrificed to the apparent penny saving of a too efficient management. There is a limit of tolerance to poor playing conditions which is set by the golfer. The limit of tolerance of environment and abuse to which the turf can be subjected is set by the grass.

Example. The habit of growth of any grass determines its tolerance to low clipping. Timothy (*phleum pratensis*) tillers high and cannot withstand low clipping; colonial bent (*agrostis tenuis*) tillers very low and can be

clipped as low as 3/16 of an inch as gauged by the mowers.

The advisor to golf clubs must make suggestions that will direct the club's effort away from the limits of tolerance and toward a mean that will assure healthy turf and complete satisfaction for the golfer.

- IV. At times, I relaxed and enjoyed the club facilities to the fullest extent; that I might learn the club customs, standards, and how a member or guest can be completely satisfied.

LIMIT OF STUDY

Fully 75% of my conversation with club golfers concerned alterations in the design of one or more holes. A tee should be changed, a new trap built, or a green re-shaped. The remaining 25% was about equally divided between proposals to reduce the golfing areas and real concern about the cultural condition of the present courses.

The players will always want alterations made

in the course design and experience has taught that all will never be satisfied, and that those most insistant in their demands for changes may have a purely selfish motive such as to lower their score, or to place an obstacle for some disliked rival.

It should be obvious that to make even a part of the desired alterations the initial cost will be high, and if the course is being maintained on a budget, any alterations divert money from the essential maintenance program. Furthermore, a very large proportion of the changes made in golf course designs, add a yearly extra charge to the maintenance cost. In addition to the probable added cost of maintenance, promiscuous alterations inevitably result in causing a well designed course to become only a series of unrelated holes, each very well designed.

There are strong influences among the club membership, even within the golf committee, urging design alterations. Before making any alterations, the services of a reputable golf architect should be retained.

In the study of golf course maintenance the design of the course is only considered when it affects

the problem of maintenance

DIVISIONS OF THE STUDY

The main body of this study will be divided into five principal sections as follows:

Section 1. The assembling of all data and facts concerning the golfing areas as I found them; indicating the assets and liabilities.

Section 2. The general statement of the problems.

Section 3. The general statement of the suggested solutions of the problems.

Section 4. The suggested solutions in detail.

Section 5. The statement of possible reduction of golfing areas, and probable results.

Each section will have the necessary subdivisions.

SECTION I

Foreword

The facts recorded in this section may be very familiar to the officers of the club; and may appear to be trivial, with little bearing on the problem. They are, however, pertinent to the problem and should not be ignored.

Historical data is particularly important in turf culture because of the cumulative effect, for better or worse, of fertilizer treatments, mechanical devices used, poor original soil condition, and many other factors. Seasonal irregularities always have a carry-over influence difficult to recognize and generally disregarded by those in charge of the course management.

The gradual accumulation of the effects of some fundamental disorder in the turf or soil is not noticed by those in close attendance, and suddenly there is a complete collapse. Knowledge of the disorder helps in diagnosis and is necessary for sound treatment recommendations.

The Golfing Areas

At present the club maintains nine golfing areas designated as follows:

1. North long course, eighteen holes
2. North short course, nine holes
3. South long course, eighteen holes
4. South short course, nine holes
5. Practice course, nine holes
6. Practice green at golfhouse
7. Practice green at lower golfhouse
8. Agora putting course
9. Agora putting lawn

(See map).

The condition and design of the practice course is so poor, and the maintenance so meager, it will not be considered in this study. No traditional reasons could be found to warrant considering its retention, and the general sentiment seemed to be in favor of abandonment.

The Design and Golfing Features

It is very seldom that one finds a group of four golf courses, so well designed for the enjoyment

of any golfer, and offering so few maintenance difficulties, as the group at the Lake Placid Club.

Each course has its particular attractions; and a careful analysis is convincing that there is a reward for accuracy of shot with each club in the bag, and only a just penalty for carelessness or incompetency. This fact should be made known to all members who desire alterations in the courses. The designers considered the courses as a whole, and not only each hole individually. Whether intentionally or through oversight, the designers made no provision for women players on the two long courses. There are no women's tees, and the score cards are not listed with women's par. Both of the long courses are truly "out" and "in" courses as the ninth holes are the farthest from the club house. Supervision is hampered by the design of both long courses, and the necessary unproductive labor time is increased from ten to twelve per cent above that found to be normal for course having a conventional design.

The North Long Course

This course was designed and constructed twenty-five years ago; it represents more than the

South Long Course, the original golfing ideas. It is an upland course, cut from wooded areas and has a number of natural or fairway level greens. It is a slow playing course, with several steep up grades, and fairways sloped to cause hanging and side hill lies.

A number of the greens are hidden from the tee, but on the par four or five holes the flags are visible from the approach shot, and the original design of number 12 hole permitted a partial view of the green. Therefore, the present unnecessary obscuring of the green is a fine example of the dangers from haphazard alterations.

The fairways are wide, (70 yards or more), and rather heavily trapped. The rough areas are exceptionally well planned to both help and penalize the player. The strips of rough between the fairways and woods prevents many balls from entering the woods, yet provides a penalty for a poorly played shot.

All traps are large, (50 feet x 10 feet or larger), and all tees are small, (average size 700 square feet), and raised. The visibility is good at all hours of the day and certain holes are made more interesting by variable winds.

Unfortunately, the Wilmington highway borders holes number 2 and 3 and is crossed in playing holes 4 and 5. These holes are great liabilities to the club and its members. An accident caused by a motorist being hit by a golf ball would be very embarrassing to the club and could cause expensive law suits.

This course is used for tournaments because it starts and finishes at the golfhouse. It is popular for this same reason and also because the player feels at all times nearer "home" and protection, than on the South Long Course.

The greens are splendidly moulded, and are small for modern golf, averaging 5600 square feet.

The greens and tees are not wholly adapted to the use of modern machinery, but the fairways and rough offer no difficulties to the newer designed equipment. The important cupping areas are larger than usually found on the older greens.

The ninth tee is .9 of a mile from the golfhouse, but nine convenient holes can be played by going out on the first five and back beginning with the 15th hole. This is an important consideration as at no time would the player be over 1/3 of a mile from the golfhouse, and he would always be near protection from storm.

The North Short Course

This is the oldest unit of the golf courses. It was built thirty-five years ago and there have been but very few changes made from the original design.

It is a delightful course; tricky, offers a chance for every club in the golfer's bag, and is very fascinating. It is short, and can be easily played in one hour and a quarter. There are no steep hills, yet there is a certain feeling of rough topography.

The greens are small for a full length nine hole course, averaging 3700 square feet, but the correct size for this course. They are not adapted to the use of modern machinery because of the rolling surfaces and irregular outlines.

The tees are very small, (10 feet x 12 feet), and raised, the surfaces being from 15 inches to 5 feet above the level of the natural soil. The fairways are more or less overlapping and easily maintained by any type of equipment.

It is a fine course for women and children and for the man who is anxious to perfect his "short game".

The cupping area on these greens is very small,

because of the general bowl type of greens.

The South Long Course

From the first tee, the player feels that here is a recently built golf course; designed to satisfy the keen golfer, and the modern playing and maintenance equipment. The course is less than ten years old and well designed. The fairways are wide. The tees are medium large, (30 feet x 50 feet), and raised. The greens average 7100 square feet which is the usual size of modern greens. A number of the greens are severely trapped, leaving narrow grass paths from approach to green. All greens are broadly surfaced to permit the use of the entire areas for placing the cup.

With the exception of the tees, this course is well adapted to the use of modern maintenance equipment.

The terrain is flat, but the rolling topography makes the golfing sporty and interesting. Normally, the course plays rather fast especially for the player hitting a long ball. The orientation of the course and the very open country, together with the blue green color of the sky line, make the visibility very poor until late in the

morning and again in the late afternoon.

As rated by modern golf standards, the design is much better for any class of player than the North Long Course, and it can be more easily maintained.

There are three very serious handicaps to the use of this course by club members.

1. The start and finish is one quarter mile distant from the real golfhouse and at least 100 feet lower in elevation.
2. While playing the course there is a distinct feeling of being detached from the club and protection in case of storm.
3. The ninth hole is over one mile from the golf house, and those wishing to play only nine holes are forced to play eight or eleven holes to avoid a long walk between green and tee.

The South Short Course

The same handicap of poor location in relation to the golfhouse applies to this course, as it starts and finishes near the lower golfhouse. It is a rather difficult course for par making, but without appeal to the player. The tees are raised; there is very

little rough, and the fairways are interlocking for the most part. The greens average 3900 square feet and are either at natural grade or raised. All greens have large cupping areas.

Putting Green by Golfhouse

Unusually conveniently located, sufficiently large and well arranged. Unlike many practice greens, it seems to be well timed with the regular greens. By timing is meant that a ball hit with equal force on the practice green and any of the greens of either long course, will travel the same distance with approximately the same degree of accuracy of line.

Putting Greens by Lower Golfhouse

These greens add much to the appearance of the highway end of the Lower Long Course. They are oversized, and very poorly timed for practice before matches or play on the regular greens.

Agora Putting Course

Of artistic design, and possibly an attractive feature for the north lawn. It should not be considered for real putting practice.

Agora Putting Green

A very great asset to the front lawn and pleasure of club members, and offering good putting practice for slow greens.

No golfer should leave the Lake Placid Club without finding many holes and putting greens to his liking.

THE PHYSICAL CONDITION OF THE GOLFING FACTORY

Soil

Physical Condition: The soil on all golfing areas is agronomically known as Gloucester loam.² As such, it is particularly well adapted to the growing of grass. It is a brown friable surface soil with light brown loose gritty loam subsurface, strongly acid, and is used

principally for forage, grain and pasture.

The friableness of this type of loam permits deep root growth, free percolation of water, and excellent capillarity; each factor a valuable natural asset. The organic matter content is high and well pulverized.

The builders of each area took full advantage of the natural soil condition and apparently made a special effort to remove all undesirable material from the top soil and to distribute the soil evenly over the playing areas. This even distribution has been an important factor in the condition of the fairways, and permits uniform fertilization and physical treatment.

This natural soil was also used as top soil for the greens and tees, and was spread at a uniform depth of 15 inches over the graded subsoil. This desirable condition of the top soil minimizes the probability of the physical condition of the soil being a primary factor in any turf table.

Drainage: The natural sub-drainage is sufficient, but slow in action; and the drainage points are easily accessible for tap drains or diverting drains. On the fairways the surface drainage is interrupted by many

shallow basin areas. Water does not remain long in these areas in the summer, but after the ground is frozen percolation is stopped and trouble making puddles are formed.

Tee drainage appears to be perfect, except on a few tees which have settled unevenly.

The original surface drainage of all the greens was sufficiently rapid, but the years of being tramped upon and the movement of free soil from top dressings has made many sluggishly drained areas. This is very noticeable on the two upper courses, and on some of the flatter greens of the lower long course.

There is convincing evidence that 90% of the winter injury that has annually destroyed or severely injured large areas of grass on the tees, fairways, and greens was primarily caused by poor surface drainage. In constructing the natural grade greens there was no provision made for sub drainage, as it probably was not necessary at that time. Today, because of the years of having been tramped upon, there are a few greens that need isolating drains to protect them from excessive soil water, which is the cause of the other 10% of the winter injury.

Fertility: In its original state the soil on all areas was very fertile and contained an abundance of the food elements needed by plants desiring an acid soil. The continued growing of one crop (grass) without the addition of fertilizers to balance the loss of available plant food by leaching and in grass clippings, has gradually drawn upon the natural reserves until some of the necessary elements are depleted to a dangerously small amount; while others have accumulated to a dangerously large amount.

The very timely tests made by Dr. John Montieth from the U. S. Golf Association in the summer of 1934 found the pH of the soil to vary from 4.0 to 6.0 and the following of his suggestion to apply lime to the soil has been very beneficial to the health of the grass. A soil pH below 5.0 is very near the limit of tolerance for grasses. As soil acidity is a fundamental factor in turf culture it must be brought to an optimum pH before other corrective cultural practices will be of greatest benefit. The optimum soil pH for blue grass is generally accepted as 6.5 and for bents 6.0.

Table Showing pH Ratings of Soil Samples Taken
Between August 12 and 17, 1935

North Long Course		North Short Course	
<u>Green</u>	<u>pH</u>	<u>Green</u>	<u>pH</u>
1	6.4	1	5.1
2	6.5	2	4.6
3	6.7	3	4.8
4	6.3	4	4.9
5	6.5	5	4.8
6	5.3	6	6.2
7	5.2	7	4.5
8	6.0	8	4.9
9	6.0	9	5.6
10	5.0		
11	6.0	South Long Course	
12	6.0		
13	5.4	<u>Green</u>	<u>pH</u>
14	5.0	1	4.8
15	5.8	2	6.0
16	6.0	3	6.4
17	6.5	4	6.7
18	5.8	5	6.8
		6	4.8
South Short Course		7	6.6
		8	6.0
<u>Green</u>	<u>pH</u>	9	5.8
1	6.4	10	5.4
2	6.5	11	5.5
3	6.4	12	6.5
4	6.9	13	6.0
5	6.2	14	5.8
6	6.6	15	6.4
7	6.4	16	6.0
8	6.2	17	6.0
9	6.7	18	6.4
Tees		pH varying between 6.2 and 6.6	
Fairways North Long		pH varying between 5.8 and 6.7	
Fairways South Long		pH varying between 6.0 and 6.7	
Golfhouse Putting Green		pH 6.2	
Agora Putting Course		pH 5.8	
Agora Putting Green		pH 5.8	

The La Mott - Morgan colormetric test was used to determine the pH of all soil samples. All chemicals were fresh and all apparatus was chemically clean before being used.

All golfing areas were limed the fall or spring previous to taking these samples, at the approximate rate of 1 tone of ground limestone per acre. The presence of lime in the soil accounts for the pH readings being higher than those from soil samples taken by Dr. Montieth.

All samples were taken from the maximum root areas as exposed by the cup hole on the day of sampling. The average depth was 1 1/2 inches below the soil surface. Because of the depth of top soil it was not necessary to take a soil sample at a greater depth.

The great variation in the pH readings can be attributed to any or all of the following causes..

1. Uneven penetration of the lime into the soil, due to the varying degrees of soil compaction.
2. Possible uneven distribution of the lime.
3. Varying degrees of acidity of the soil at the time of applications of the lime.

Numbers 1 and 3 are the most probable causes.

While no definite relationship can be found

between the degree of acidity of the soil in the greens and the evaluation ratings of the greens, it can be generally stated that the best greens are those having a soil pH reading between 6.0 and 6.4.

Twelve composite samples were made by mixing soil taken from several greens and fairways. The samples were carefully selected and are representative. They were tested by the generally accepted colormetric tests used in agronomy laboratories to obtain the amount of available plant food elements.

The results of these tests showed a varying degree of soil fertility.

Pounds of Available Plant Food per Acre
from Twelve Composite Samples

	Maximum	Minimum
Ammonia nitrogen	2	0
Nitrate nitrogen	40	10
Phosphorus	150	90
Potash	less than 50.	50
Magnesium	50	50

The small amount of ammonia indicates the soil is friable and there is no anerobic condition. The relatively large amount of nitrate nitrogen, (only one sample read 10), indicates the grass plants are not assimilating the nitrogen as fast as it is being

liberated in the soil and that there is therefore a considerable loss from leaching in the event of a heavy rain or watering. The bright green color of the weeds indicates they are absorbing a sufficient amount of the nitrogen.

From seventy-five to eighty pounds of available phosphorus per acre is an optimum amount for turf grasses. Excessive amounts are encouraging to weed growth, particularly clover and annual blue grass.

The large amount of phosphorus is probably due to the high phosphorus ratio fertilizers that have been applied in the past years.

The amount of magnesium is satisfactory and there should be no serious deficiency of this element for several years.

The available potash is at a dangerously low amount, in fact below the tolerated minimum. Vegetative growth indicates that there has been very little available potash for several years. The small amount supplied in fertilizers has been used by the plants or leached from the soil. In the rough area, which has received no fertilizer, potash deficiency is indicated by the presence of Devil's Paint Brush (*Hieracium aurantiacum*); Ladies' Tobacco (*Antennaria canadensis*),

and other weeds tolerant to a low potash soil.

Potash deficiency effects the general health of the grass, making it less resistant to all fungus diseases attacking the grass, particularly when combined with a strongly acid soil condition. It effects the efficiency of the grass blade for synthesising and translocation of carbohydrates, which in turn makes the grass more susceptible to winter injury, and very slow to recover from any injury.

The fertility of the soil is at present in an unbalanced condition which can be easily corrected by the use of selected fertilizers. The large amount of organic matter is a reserve food supply which nature is very wisely liberating in small quantities.

Vegetation: One of my first impressions while inspecting the course was the very obvious fact that nature intended the Lake Placid Club to have a fine golf course, not only is excellent soil supplied, but the natural grasses are suitable for golfing turf. Bents in various strains and species are growing over the entire golfing areas. There are small areas of fescue on the upper courses, and there is only a few patches of Kentucky blue grass (*Poa protensis*), each

patch covering less than 1000 square feet of turf. The area is definitely in a bent grass region and any attempt to introduce blue grasses is directly contrary to nature.

It is necessary to record in general the existing vegetation on a golf course because any change in the vegetative growth is an indication that conditions are either better or worse.

Tees: 1. North courses. The five best tees are well covered with creeping bent (*Agrostis stolonifera*) and colonial bent (*Agrostis tennis*); the remainder have more than 50% annual blue grass (*Poa annua*); clover (*Trifolium repens*); and miscellaneous weeds.

2. Lower courses. All tees are very well turfed with bent and annual blue grass in a 60 - 40 ratio. The comparatively few weeds need not be considered.

There is very little winter injury on the tees, (No. 5 north long course an exception), due to the fact that all tees are elevated, and therefore well underdrained and surface dried by winds.

Fairways: Previous to the spring of 1934 all of

the level fairways were covered with a thick turf of creeping and colonial bent, and the hillside fairways with red fescue and bent. At present, the level fairways are green in appearance, but rather poorly turfed with native creeping and velvet bent (*Agrostis canina*) struggling to fill the vacancies caused by the grass dying in the severe winter of 1933. It should be noted that the grass was killed only in the many shallow pocket areas, and that grass on knolls and dry soil did not suffer from the cold. The sloping fairways are also well turfed at present. The basic grasses³ are not killed by low temperatures alone.

The native grasses are spreading quite rapidly and if given a correct fertilizer will completely cover the fairways.

Attempts have been made on each of the courses to repair the fairways by re-seeding the injured areas with a mixture of Canada blue grass (*Poa compressa*); Kentucky blue grass, red top (*Agrostis alba*), white clover, and English rye grass (*Lolium perenne*). The proportion of the various quantities of grass in the mixture was very indefinite, and there appears some doubt if all the varieties were used. Apparently in

the fall of 1934 and spring of 1935 some of the fairways were seeded with a mixture consisting of 60% Kentucky blue grass, 12 1/2% Red top, 25% Chewing's fescue (*Festuca rubra* var *fallax*), 2 1/2% Colonial bent, and 25% rye grass. The uncertainty of the above two statements is due to the fact that very few records of the cultural treatment on the courses have been kept by the club.

The vegetation on the "repaired" areas now consists primarily of sickly white clover, annual blue grass, knott weed, dandelion, and miscellaneous weeds.

The two seed mixtures were poorly chosen. In the repairing mixture Kentucky blue grass is the only basic grass and it is proven that it is not adapted to the region. The mixture used on the fairways also contained a large amount of Kentucky blue grass. Chewing's fescue is a basic grass but is more effectively used either alone or mixed with colonial bent. Colonial bent is a basic grass adapted to the region, but the amount in the seed mixture is relatively small. I believe at least 80% of the seed sown on the fairways during the past two years has been ineffective.

Putting greens:

Upper courses. The basic grasses are velvet bent in two very excellent strains, and creeping bent, (Cocoos), growing high, coarse, and grainy. It is very obvious that the highly desirable velvet bent is the dominating grass and that weeds and other grasses are present because of the unbalanced fertility of the soil. The velvet bent was not as severely injured during the past two winters as the creeping bent or colonial bent. This is typical of conditions found throughout the northern United States.

Annual blue grass is entering a few greens but it has not gained a permanent hold as yet. Only one green, No. 18, had any crab grass (*Digitaria sanguinalis*) and that had been pulled out before August 1.

The principal weeds found on the greens are yarrow, pearlwort, thyme-leaved speedwell (*Veronica serpyllifolia*), small leaved pennywort, and knotweed. There is also a small amount of clover, and weeds commonly found in a weakening putting green turf. There is no evidence that weeds are being introduced through the top dressing soil. All principal weeds are in patches, and pearlwort and annual blue grass are the most troublesome weeds.

Nearly every green has several patches of very poor grass and weeds caused by sods being taken from the fairways and used for patching on the greens. Many of these sods are sources of annual blue grass seed and the clover invasion. The sods were poorly selected but the workmanship in laying them was excellent.

With the exception of the turfed spots the putting on these greens is very true.

Lower courses. Basic grasses, coarse creeping bent (probably Coccoos) and velvet bent. On the long course there is much more creeping bent than velvet bent on the greens, but on the short course the varieties are evenly distributed.

The principal weeds are annual blue grass, thyme-leaved speedwell, clover, and mouse-ear chickweed (*Cerastium vulgatum*). There are very few scattered weeds on the long course, but many on the short course. Patching with fairway turf and seeding with an improper seed mixture have made patches of weedy and thin turf.

Rough areas:

Upper courses. There are several areas of

velvet bent and one small Kentucky blue grass area. The principal vegetation consists of weeds that grow on impoverished soil, and unfortunately some pearlwort and annual blue grass. The rough can be classed as very clean.

Lower courses. Bents, particularly velvet bent, compose a large part of the rough vegetation except in the very poor soil areas and two large areas thickly infested with dandelion. This rough can be classed as clean, but the dandelions must be kept in control.

The vegetation proves that excellent turf can be had without undue expense because the native grasses are of the varieties suited for golfing turf, and it is very obvious that velvet bent is the grass to raise and encourage.

GENERAL CULTURAL CONDITION OF PUTTING GREENS

In general the cultural condition of the greens is not satisfactory, though their present evaluation is above that found on many courses.⁵

The drainage and unbalanced fertility of the soil have already been discussed. On the upper courses slow recovery of the cup plugs and the noticeably poorer turf in the cupping areas indicate a lowering of the cultural condition, as also do the scald spots that occurred on green number 6 during the week of August 12.

The depth of the grass roots in the soil is very shallow and the presence of corded roots indicate that normal decomposition of the annually discarded roots, is not taking place.⁴ The corded roots also tend to make a thatched-like mat which does not permit the free percolation of water into the soil beneath the upper root zone.

The creeping bents on the greens have not been top dressed or combed frequently enough, and have become coarse leaved and long sheathed, making it now very dangerous to clip the grass as short as the players desire.

Close or short clipping would cut the grass below the tillering point; practically stopping photosynthesis, and forcing the grass plant to develop new blades by drawing from the food supply stored in the roots. The repetition of too close clipping will

very soon destroy the plant. It is this condition that makes the creeping bent greens slow to putt on, soft to land a pitched shot upon, and easy to make an impression in with the feet.

As any business should take an annual inventory so should the greenkeeper take an annual inventory of the cultural condition of the putting greens. A comparison of two inventories tells accurately at once, whether the green has improved or not, since the time the last inventory was taken, and no fickle or prejudiced memory is relied upon. From the details of such an inventory the next season's cultural program can be planned.

During my inspection I inventoried and evaluated each putting green at the Lake Placid Club, the results are recorded later in the study. The method used for evaluating a green originated with the author several years ago and has been published in the trade journals. It is used very advantageously by the author in all professional studies of any fine turf areas, and is based upon a system of maximum values given to each of several important factors influencing the cultural condition of the entire green.

Table Showing Factors Considered
When Evaluating a Putting Green

<u>Factor</u>	<u>Maximum points obtainable</u>
Suitable grass	20
Health of grass	10
Texture of grass	5
Varieties of weeds	5
Number of weeds	5
Surface (not design)	10
Scars (freedom from)	15
Physical condition of soil	<u>30</u>
	100

The maximum number of points for a factor was arrived at after two full seasons of practical tests made on approximately 180 putting greens. Each factor also influences the other factors; i.e., a scar could be made because the surface of the green was so rough, that the close clipping putting green mower cut a grass, not suited for putting greens, below the tillering point, thus causing a stubble like growth of the grass and eventually killing it.

Comparisons should not be made of inventories compiled by different individuals as the personal factors are different.

Table Showing
Inventory Values of Cultural Condition
of Putting Greens on North Courses

Long Course		Short Course	
<u>Green number</u>	<u>Value</u>	<u>Green number</u>	<u>Value</u>
1	73.5	1	76.5
2	85.0	2	75.5
3	84.0	3	68.5
4	71.0	4	64.5
5	73.5	5	72.5
6	72.5	6	80.5
7	78.5	7	78.5
8	76.0	8	77.5
9	60.0	9	66.0
10	72.0		
11	74.0		
12	72.5		
13	70.5		
14	56.5		
15	81.0		
16	82.0		
17	81.5		
18	56.0		
Average	73.0	Average	73.0

Table Showing Per Cent of Perfection
of Component Parts

<u>Long Course</u>	<u>Item</u>	<u>Short Course</u>
85	Suitable grass	87
75	Health of grass	74
66	Texture of grass	63
60	weed varieties	63
60	Weed quantity	67
78	Surface irregularities	75
88	Scars	85
60	Physical condition and fertility	59

The fact that there is 85% suitable grass growing on the green in their present state of condition is very encouraging. Improvement of the physical and fertile condition will add to the value of all factors, and they, therefore, should be given priority in the cultural program and practice in 1936 and 1937

(See Table on Page 41.)

From a comparison of the component parts of this evaluation and one made in August, 1936, there can be obtained much information from which a safe cultural program can be planned for 1937.

The present condition of the greens has been slow to develop, and sound cultural practice dictates that any suggested improvements should be along fundamental lines and show their affect slowly. If normal weather conditions prevail and the suggestions outlined in this study are followed, I predict noticeable improvement in the courses in 1936 and splendid golfing in 1937, all without player inconvenience.

Table Showing
Inventory Values of Cultural Condition
of Putting Greens on South Courses

Long Course		Short Course	
<u>Green number</u>	<u>Value</u>	<u>Green number</u>	<u>Value</u>
1	75.0	1	73.0
2	82.5	2	63.5
3	86.0	3	65.0
4	80.0	4	58.5
5	83.0	5	50.0
6	84.0	6	73.0
7	80.0	7	49.5
8	80.0	8	54.0
9	77.0	9	52.0
10	79.5		
11	85.0		
12	80.5		
13	80.0		
14	74.5		
15	77.0		
16	83.0		
17	80.0		
18	73.0		
19			
Average	80.	Average	60.

Table Showing Per Cent of Perfection
of Component Parts

<u>Long Course</u>	<u>Item</u>	<u>Short Course</u>
88	Suitable grass	67
80	Health of grass	61
66	Texture of grass	39
73	Weed varieties	60
84	Weed quantity	60
81	Surface	48
89	Scars	59
70	Physical condition and fertility	56

AMOUNT OF PLAY UPON THE COURSES

Based on the present actual requirement as observed by the writer, and from the attendance and play records, the club has 200% more available golf than is needed. If enjoyment and club traditions are included in the requirements there is still 100% too much golf course.

One eighteen hole golf course can usually satisfy the golf club requirements of a town of 7000 population. The Edison Country Club at Rexford, New York, has a very active playing membership of 800, and there is seldom congestion on their 27 hole course.

The following maximum capacity table is based upon play starting only between the present normal hours, and the play progressing in a leisurely manner. All players would be back in time to dress for the noon and evening meals, and none would have to hurry their morning meals. However all play would be in foursomes.

Table of the Present
Maximum Convenient Daily Play
On All Courses

<u>Course</u>	<u>Start Between</u>		<u>Rounds</u>
North Long	8:30 - 10:00 A.M.	2:00 - 4:00 P.M.	244
North Short	8:30 - 11:15 A.M.	2:00 - 4:15 P.M.	304
South Long	8:45 - 9:45 A.M.	2:15 - 3:45 P.M.	160
South Short	8:45 - 10:45 A.M.	2:15 - 4:00 P.M.	236
Total playing hours 14 3/4			944
If all play in twosomes			500
Capacity at normal maintenance cost			320
Probable additional maintenance cost if play increased to 500 rounds per day			110%
to 944 " " "			275%

Table Showing
How Present Play Is Divided
Between the Courses*

Per cent of total play on North Long in 1934 to Aug. 19-	56.7
" " " " " " " " 1935 " "	"- 55.9
" " " " " " South " " 1934 " "	"- 13.3
" " " " " " " " 1935 " "	"- 14.5
" " " " " " North Short " 1934 " "	"- 25.8
" " " " " " " " 1935 " "	"- 27.3
" " " " " " South " " 1934 " "	"- 4.2
" " " " " " " " 1935 " "	"- 2.3

Summary

Total Maximum capacity 100 playing day season, which is probably short	94400 rounds
Total maximum twosome capacity	50000 "
Total maximum rounds maintenance capacity	32000 "
Total number of rounds played, best of years 1932-33-34	12115
Per cent of foursome capacity used	12.8
Per cent of twosome capacity used	24.0
Per cent of maintenance capacity used	37.0

* Data from golf starters records.

Because of various reasons all of the members and guests that play the game of golf do not play on the Club golf courses. The following data was obtained by careful observation and could be verified or corrected from attendance records. Data is based on a daily club attendance of 500 persons.

Non players - children	3%	
elderly women	22%	
men not		
golfers	<u>5%</u>	
	30%	Players 70% or 350
Players preferring a rest from golf	20%-	70
" attracted by other club		
and community activities	35%-	115
Players finding golf too expensive	30%-	105
Balance to play	17%-	<u>60</u>
		350

The average daily play from August 1-19 inclusive was 54 rounds. As undoubtedly a number played two rounds, there were probably less than 50 actual players each day.

A committee from the club should study the reason why play increased in 1933 over 1932 but fell below in 1934 and particularly note any correlation between club attendance and play on the golf courses.

Through August 19 the number of rounds played in 1935 was 9.6% less than through the same period in

1934. For the same period receipts were 15% less in 1935. Yet in 1934, 70.6% of play was on the long courses, and in 1935, 70.5%. Unless the greens fee has been reduced from the 1934 fee, it appears that golfers are taking advantage of the 10 day rate. The committee should also study these facts.

The foregoing statistics show conclusively that the club is maintaining 54 holes (if practice course is included) more than sound business warrants, and 45 more than club business requires.

It is fitting that a paragraph concerning the golfhouse be inserted at this point.

There should be no criticism of the golfhouse, or its management. The three men, Mr. Searls the professional, Mr. Dowling clerk, and his assistant are doing excellent work for the best interest of the club and their suggestions should always be given consideration.

MANAGEMENT AND DIVISION OF COSTS

The study of the management and division of costs of a golf club must be courageously made if it is to be of full value. There should not be any appearance of an innertigotian, and only those items pertinent to the study involved, should be noted. The study should be strictly impersonal.

The necessary data was not difficult to obtain at the Lake Placid Club, because there was no question of disloyalty or shirking of work.

The golf committee:

A committee composed of a very active chairman and seven other club members. Its function is to advise the golf director, supervise tournaments, and to consider the requests of players. The committee represents the "Golf Association of the Lake Placid Club".

The minutes of the meetings of this committee were thoroughly studied by the writer. The general discussion was found to be quite typical of that of large greens committees or golf club executive boards. Over 70% concerned the alteration of holes or new construction projects and tournaments. The remaining 30% dwelt upon the course maintenance, and a pitiful

lack of knowledge of the fundamentals of turf culture is demonstrated by the very indefiniteness of action and uncertainty of ideas.

The committee made two important suggestions in 1934: (1) That a greenkeeper for the golf courses be appointed, and (2) to obtain the services of Dr. John Montieth of the United States Golf Association Service Section. The valuable suggestion that "Ladies tees" be erected was given some consideration but not nearly so much as the proposal concerning fairway watering.

There appears to have been no effort made to increase the play upon the courses, and the tournaments are unfortunately becoming less popular.

Golf director:

The position of Golf director combines the duties of greenkeeper with those of the very important office of Treasurer of the Lake Placid Company. Each office is important enough to require the entire attention of the encumbent and because of ^{the} unusual ability of the present encumbent, Mr. Deo B. Colburn, combined with the help of natural turf conditions, the combining

of the duties has worked unusually well.

At present, every operation on the golf course and all purchases of supplies are directed from the office of the Golf director. Such directorship places the maintenance and operation of the "golfing factory" even to the minutest detail, under a man trained in profession entirely foreign to golf course maintenance and who is the same time holding another position worthy of his training and full-time efforts. Many important decisions concerning the golf course are necessarily made in the office without personal knowledge of the facts. Furthermore, at the time golf universally became a business, the position of the "man in charge of the course" was raised from foreman to the professional position of greenkeeper..

Frankly, the present position of Golf director is unfair to the incumbent and to the golfing interests at the club. Office management of golf courses has been tried many times and as many times has failed, primarily because a business man is not fitted to be a doctor (turf doctoring is the important part of a greenkeeper's duties) any more than a doctor can ever be a business man.

I have great sympathy for Mr. Colburn, the Golf Director, for the golf courses must have caused many hours of worry and much feeling of uncertainty. I also have great admiration for his ability and congratulate him for the results obtained, even with a handicap.

Foremen:

Directly responsible to the Golf director are two foremen, Mr. Eric Vihlem for the north courses, and Mr. Samuel Silts for the south courses. The present arrangement makes them merely foremen who receive, transmit and carry out orders, report incidents, but are not expected to make decisions. They are liable for responsibilities placed upon them but have only moral authority, and there appears to be little opportunity for initiativeness.

Both foremen are capable, and their fine qualifications should be recorded in this report. They are men of splendid character, and sincere in their work. Mr. Silts is a local man thoroughly familiar with the soil, weather, and the community. A fine director of men, and one who insists upon thoroughness.

Mr. Vihlem is making a study of his work, is a keen observer, and in my conversations with him, I found him to have the qualifications necessary to become a greenkeeper.

Each foreman works only eight or nine months of the year.

Laborers:

The laborers are of the type adapted to golf course maintenance. They are careful, not excitable or careless, and have Yankee resourcefulness. Many have worked at the club for a number of years and have come to look upon the position as secure. The system of management has not developed the ability of the men and has made them routine factory workers. They are prompt to start work and sure to stop at the scheduled hours. They work steadily without loafing, but often inefficiently.

I wish particularly to call attention to the splendid ability of the mechanic. Without him, or his equal, there would be much time lost because of needed repairs on equipment, and the greens would not be so

well cut. Very seldom does one find all the mowers on a golf course cutting cleanly and evenly. They are on these courses and that fact helps greatly to make good fairway lies and truer putting surfaces. The mechanic is also a part-year man and much of his time is spent as a plumber on the course water system.

There are nine laborers on the south courses, and ten on the north courses, one of the latter being assigned to the Agora lawns and putting greens which require his full time. The number of laborers appears to be sufficient. The working day is eight hours, 7 A.M. to 4 P.M. No overtime is permitted, thus, if an emergency occurs such as watering at night, the time used at watering must be taken from the daily work. Three of the men on each long course are designated as greensmen, each caring for six greens, and one man is detailed to the greens on each short course.

ITEMS OF FALSE ECONOMY

Because of the general economic situation the management of the courses for the past few years has been distinctly of the "hand to mouth" type. The immediate cost without regard to the cumulative effect has determined the purchases. A few examples of such forced "economy" follow.

1. The purchasing for years of low grade, high phosphorus ratio fertilizers. 4-8-4, 2-12-4, and 2-8-5.
2. The continued use of Ammonium sulphate over a long period of years, and on a soil naturally acid.
3. The failure to maintain a sufficiently large turf nursery and, therefore, the patching of the greens with unsuitable fairway sod.
4. The sowing of Kentucky blue grass seed and especially Canada blue grass seed for use on a soil indigenous to bent grasses.
5. The sowing of white clover, a very undesirable plant on golf courses.
6. The failure to purchase the necessary fungicide to protect the greens from the annual attacks of snow mold.

I am certain that the necessity for keeping the expenditures as small as possible prompted the above "economics," for at the suggestion of Dr. Montieth that lime was absolutely needed, a sufficient quantity was immediately purchased and applied to the courses.

Routine Management

The routine management of the courses is good and the general workmanship is excellent.

The height of cut and frequency of mowing the various areas are consistent with good cultural practice, and I particularly commend the method of handling the clippings from the greens on the north course, that is, placing them in inconspicuous green painted barrels to be collected at convenient times.

Each greensman changes the cup on the greens he mows. This is a rather unusual practice but as the cup changing is well done both as to locations selected and actual changing, I can see no reason for changing the system.

Last fall each green was treated with an application of bichloride of mercury at the rate of 2 ounces per 1000 square feet. This fungicide reduced the injury from the snowmold fungus, (*Fusarium nivale*), to a minimum.

The policy of setting the mowers higher in the spring than during the summer has resulted in

permitting the creeping bent on the greens to tiller high and to be weakened by the closer clipping during the summer, and in some cases to be scalped.

When watering of the greens is required, it is done after six o'clock in the evening.

The present labor distribution will be discussed as a part of the recommendations.

It appears that fall seeding has been only partially successful, and that spring sown seed is almost certain to produce turf. This is an important factor and should be remembered. The high altitude of the club and early frosts in the fall are the causes for the reversal of the generally accepted facts that in the north part fall seeding of turf is a better practice than spring seeding.

Several methods of fairway renovation were tried last fall and this spring; also different methods of seeding in winter injured areas. The experiments were fully justified and the procedure in each case was sound. The results are disappointing and do not justify further expenditure of time and funds along the lines tried. Mr. White, a former foreman, stated

that fairway harrowing produced excellent results at the Saranac course, and I suggest that Mr. Vihlem and Mr. Silts be sent to Saranac to consult with the greenkeeper about such a method of fairway renovation.

Costs and Record Keeping

The system of cost keeping is very satisfactory from the bookkeeping standpoint, but very confusing to study from the course management viewpoint.

The total expenditure of \$15,133.34 for the maintenance of the golfing areas for the year 1934 was approximately 25% lower than the average 1934 expenditures for similar areas in the United States. The shortness of the playing season may account for 10% of the 25%, leaving the fact that the courses at the Lake Placid Club were maintained at a cost 15% lower than other similar areas.

I was pleased to find the labor costs for 1935 were listed both in labor hours and cash amount. In the study of labor distribution the labor hour is

more important than the cash item. Unfortunately, I could not gain much helpful information from these records, as the items were indefinite. An item of \$821.28 for administration was charged to the north courses, and none to the south. This and other items make it impossible to compare the costs with normal costs.

The division of costs on the average 18 hole golf course is as follows; the greenkeeper's time being included as labor. Equipment, supplies, fertilizer, repairs, etc. 29% - 31% of total cost. Labor 69% - 71% of total. Labor is divided as follows: Greens - 37%, Fairways - 12%, Tees - 6%, Traps - 8%, Rough - 6%. New Construction or alterations - 7%. Miscellaneous - 24.0%.

I believe the above distribution of expenditures can be adopted by the Lake Placid Club for the budget of the golf course maintenance costs.

The foremen are not required to keep records of work performed, fertilizer applications, attacks of disease, or other factors. A systematically kept record of operations is an essential part of the

efficient management of golf courses.

Equipment

As a whole, the equipment is suitable for the operation of the courses at their present standard of maintenance. All major equipment is old, and kept in operation because of the skill of the mechanic. Replacements will be necessary within the next two years, and the replacements must be made with more efficient types. While an inventory list is not necessary in this study, I wish to call attention to the most important items.

Mowing equipment.

Two 5 unit gang fairway mowers. A sufficient number of cutting units on hand for actual mowing, but no spare units for use while a unit is out for repairs. The mechanic estimated the mowers were operating at least 20% of the time with four units and at times with only three units. In such cases the mowing efficiency is reduced 24% because of not having a spare unit for the fairway gang mowers.

Green mowers.

There are eleven ancient type high wheel putting green mowers, suitable for use on tees and Agora front and close lawn, but not for putting greens; six low-priced putting green mowers of a more modern type; and two comparatively new and modern machines. All mowers are kept in excellent cutting condition by the skill of your mechanic.

Two heavy and much worn Fordson tractors are used to haul the fairway mowers.

Hose.

All old hose is 1/2 inch size, but the new hose purchased in the spring is 3/4 inch.

Shop and storage.

The shop is large, well built, equipped with ample power for machinery, and a good carpenter shop and forge.. There are no electric lights and no heating apparatus. There is ample storage room suitable for fertilizer and machinery, and a large shed admirably adapted to the storage of loam and compost.

Sod nursery.

Two very small sod nurseries can supply less

than 1000 square feet of suitable putting green sod and 500 square feet of tee sod.

Tee boxes and benches.

All tee boxes are of the long discarded type of sand, water, and a dirty towel. Tee benches are simple, but in my opinion ideal for a golf course.

Minor equipment.

All very old in age and type.

For efficient operation the equipment lacks several important pieces, and many of the pieces in use at present should be replaced by newer types.

Summary of Conditions Aug. 19, 1935

The golfing business at the Lake Placid Club is equipped with a large and well built factory, the timbers and foundations are solid, but the superstructure needs repairing.

The machinery is in excellent condition and with the addition of tees for women's play, can produce the best golf obtainable.

The tools are of poor quality, of inferior type, and insufficient in number.

The laborers. Sincere craftsmen capable of turning out a better product.

The manager (greenkeeper). Not sufficiently trained in his profession.

The product. Remarkably fine golfing environment, and an adequate variety of playing conditions to satisfy any reasonable golfer.

Capacity and Sales.

The plant is producing 320 rounds of golf per day and has sold an average of 43 rounds per day during the playing season to date.

SECTION II.

THE PROBLEMS

The general problems are few, but each one has many important details as sub-problems. A more intimate knowledge of the club policies and ideals will probably find others; if so, they should be added to those herewith listed and their solution should be based upon fundamental principles. Each problem listed is of great importance, and their sequence should not be considered as the order of priority. The principal problems are as follows:

1. To convince the officials of the Lake Placid Club, and the Advisory Golf Committee in particular, that no part of the solution of the immediate problems can be accomplished by any alteration in the design, except by the addition of women's tees.
2. To develop a system of management that will assure sound cultural practices and efficient utilization of labor and mechanical effort.
3. To improve the fairway turf.

4. To establish a program for the reduction of winter injury to the turf.
5. To determine the scope and type of golf needed by the Lake Placid Club, and then to develop a plan whereby the amount of play will be at least 75 % of the maintenance capacity of the plant.
6. To establish a maintenance budget and a definite policy in determining the amount.
7. To improve the present handicapping system that more golfers will enter the tournaments.
8. To make golf less expensive to club members and guests, and to cause more golfing.

The officials of the Lake Placid Company, and the Golf Advisory Committee, must sit in joint session and with serious deliberation frankly consider these problems, and their solution from the fundamental sources.

SECTION III.

GENERAL SOLUTION

In making these suggestions for the general solution of the various problems, I feel that the board of directors of the Lake Placid Company must immediately adopt one of three following definite plans.

I. To make golf a major activity and attraction operated on a business basis.

II. To greatly reduce the golfing areas and consider golf as secondary to other activities.

III. To continue along the lines of least resistance, as at present, making a special effort to the rehabilitation of the courses as necessity demands.

There can be no compromising of plans, and having once made a selection, it should be developed on a long term plan.

PLAN I.

1. The re-organization of the management of the golfing interests, and the placing of responsibility

as follows:

Board of Directors, Lake Placid Company
Golf finance officer, a member of board
of directors

Golf manager Golf house manager
Foreman

2. The placing of golf on the "Free" list of activities by a change of method of financing.

3. The reduction of the golfing areas to a size warranted by club traditions and sound business practices.

4. The improvement of the present system of handicapping.

5. To establish definite budgets for course maintenance, club house management, entertainment, and prizes.

6. The strict adherence to the above established budgets.

7. The adoption of a reasonable long term maintenance program for the golf course.

8. The adoption of a reasonable program for the correction of the drainage of the course.

GENERAL SOLUTIONS

PLAN II.

1. The employment of a foreman who has had technical training in greenkeeping, and to be responsible to the golf director.

2. The reduction of golfing areas to one nine hole course or possibly one eighteen hole course.

3. Items 4, 5, and 7 of suggestions for Plan I.

4. The charging of a fee for golfing and the determining of the budget by fee collections.

GENERAL SOLUTIONS

PLAN III.

1. The management and operation to remain as it is at present.

2. Treating each serious problem as an emergency, and obtaining technical advice for its solution.

SECTION IV.

DETAILED SOLUTIONS

The choice of three definite plans has been offered for two reasons. (1) Because the adoption of any one of these plans will influence the golfing atmosphere at your club. There will be either a stimulation of play and interest, a general decrease in play and probably attendance at the Club, or the continuance of the present indefiniteness and gradual reduction of play and interest. An average of 17.9 players per tournament for ten tournaments is recorded in the minutes of the meetings of the golf committee on August 7, 1935. That is very strong evidence that there exists an atmosphere of indifference to golf among the members and guests. (2) To cause the Board of Directors and golf committee to become executive in their actions and make truly important decisions. Nearly all of the decisions recorded in the minutes of procedure could and should have been positively made by a greenkeeper or golf manager, and only a few needed submission to the Board of Directors for approval.

It is strongly suggested that the Board of Directors adopt Plan I, as with it there can be had pleasurable golf on a business basis. However, the details of the solutions for Plans II and III will not be neglected.

PLAN I. Management

The present management appears to be lacking in technical training in the cultural factors, to be mechanical in action, and to be confused at times of emergencies; it is, however, unimpeachably sincere and honest in its effort.

The multiplicity of duties of the Golf Director together with a training in a profession entirely different from greenkeeping, undoubtedly has its effect upon both the unusual loyalty and feeling of uncertainty as to what to do, that is present in foremen and laborers.

A factory involving such an enormous investment as the golf courses, should be operated by an individual thoroughly trained in the details of operation.

Division of Responsibilities

The Board of Directors.

To act upon policies and major projects. To be the "Court of Appeal", and to be strictly executive in their consideration of the golfing problems.

In the actual management, the board is to be represented by one of its members, who might be designated as Golf Finance Officer. He would be responsible to the directors and act as a liason, if necessary, between the golf committee of the club and the golf manager, and the manager and the board of directors. He should determine the size of the annual budget, act as auditor and handle all matters involving the receipt and expenditure of money.. He should not attempt to divide the budget into its working parts.

Golf Manager.

The golf manager should have complete charge of the details of the cultural management of the golf areas, and general golfing. The position should be on a twelve month basis, and during the winter include assisting in the management of the winter sport areas.

The salary offered should be large enough to attract a trained and enthusiastic man, otherwise the plan will fail. I suggest as a starting salary, the equivalent of \$3,000 a year. This is less than many greenkeepers of eighteen hole golf courses received prior to 1933 and compares favorably with club manager salaries of today.

It would be the duty of the golf manager to divide the budget and operate the golfing plant in an efficient manner. He would purchase materials and labor as he saw fit, under the general auditorship of the finance officer. He would organize golf tournaments and attempt to make the golfing attractive to the resident members and guests.

The employment of a carefully selected golf manager who could devote his entire time and energy, as manager of the golfing plant (one of the largest single investments of the company), would raise the prestige of golf in the minds of the players, and force business consideration by the Board of Directors.

Under this suggested change of management only one foreman would be required. He should be employed for the full year with an attractive salary, and

during the winter work as a watchman over the courses to cut drains, remove ice, destroy snowmold and perform many other acts of trouble prevention. Whatever the management of the courses is, the employment of a competent watchman throughout the winter will prove a paying investment.

Foreman.

The foreman would act as a working leader, as an efficient golf manager would be about the course early and late, and would continue to employ only men who could be trusted to work faithfully.

PLAN II. Management

If Plan II is adopted, the foreman selected should have had some technical training in the sciences of agronomy and plant pathology as well as practical experience in greenkeeping. He should be employed throughout the late fall and early winter to do work necessary for the safe wintering of the course, and should resume his duties early enough in the spring for the complete preparation and repairing of equipment before the rush of spring work starts.

I believe the golfing areas are managed as well and as efficiently as they possibly could be under the present system and policy of management, but golf has outgrown the system and, therefore, the system must be changed because the high standard of maintenance demanded by the players has narrowed the limits of tolerance within which the grassplant can exist, and a reduced budget makes it imperative that each operation should be justified to a point beyond the immediate cash receipt and expenditure.

The golf committee of the Golf Association of the Lake Placid Club should continue to function in an advisory capacity and particularly as directors of the social part of the tournaments. This committee can be of great assistance as representatives of the players, and it should hold regular meetings with the golf manager and finance officer.

Reduction of Golfing Areas

It is my recommendation that the south short course be immediately abandoned as a golfing area, and that the putting green by the lower golfhouse be hence-

forth maintained as fairway turf. There are no business or sentimental reasons for their continuance, and they should not be re-opened until there is probable reason to expect an average daily play of not less than 50 rounds.

Based upon 1935 play through August 19 the abandonment will reduce the greens fees less than \$200.00 and the maintenance bill at least \$700.00. The bookkeeper's figures or time sheets may not total as large an amount, but the accuracy of the present division of costs is questionable.

In addition to an annual saving of \$500.00, there should be a considerable reduction in taxes.

There are as many reasons for the retention of the north short course as for the abandonment of the south short. It is the most efficient section of the golfing plant and is selling approximately 66% of its present maintenance capacity. This has been found to be an almost ideal condition as it leaves a margin of safety sufficiently large to meet any ordinary emergency, and the course is never really crowded.

Several possible reductions of golfing areas will be offered with data and comments concerning each. The

budget, as estimated for 1936, includes the cost of all management except the Golf Finance Officer but does not include the cost of any fertilizer for the fairways.

PLAN I. Reduction of Areas

Continue the maintenance of both long courses, the north short course and golfhouse and Agora putting areas.

Estimated Budget for 1936	\$19,000
Daily playing capacity (foursomes)	600 rounds
Daily maintenance capacity	275 "
Average daily play should be	190 "

Any plan which involves the retention of the north long course means that necessary steps should be immediately taken for the protection of the Wilmington Highway. This is discussed later in the study.

This plan will permit an easy transition from the present golfing system to the more restricted pleasurable golf on a business basis.

PLAN II. Reduction of Areas

To have one eighteen and one nine hole course.
This can be accomplished by combining certain holes of
the long courses.

Suggested 18 Hole Course

	Play hole	Yardage	Par
1.	No. 1 North long course	367	4
2.	No. 1 South " "	408	4
3.	No. 2 " " "	206	3
4.	No. 3 " " "	559	5
5.	No. 4 " " "	165	3
6.	No. 5 " " "	528	5
7.	No. 6 " " "	427	4
8.	No. 7 " " "	456*	5
9.	No. 8 " " "	348	4
		<u>3464</u>	<u>37</u>
10.	No. 9 " " "	139	3
11.	No. 10 " " "	459	5
12.	No. 13 " " "	458*	5
13.	No. 14 " " "	188	3
14.	No. 15 " " "	559	5
15.	No. 16 " " "	346	4
16.	No. 17 " " "	227	3
17.	No. 18 " " "	418	4
18.	No. 18 North " "	350	4
		<u>3144</u>	<u>36</u>
Total yardage		6608	par 73

* Either one or two of these holes could be easily re-measured to 445 yards and par reduced to a difficult 71 or 72.

On this proposed course the visibility would be bad on about half of the holes, but it would not involve hill climbing except at the last hole. It starts and finishes at the natural place: the present golfhouse, and there is not^{the} dangerous playing hazards of crossing the Wilmington Highway. Furthermore, the maintenance would be over reasonably concentrated areas.

Suggested 9 Hole Course

	Play hole	Yardage	Par
1.	No. 1 North short course	140	3
2.	No. 2 " " "	160	3
3.	No. 3 " " "	120	3
4.	No. 4 " " "	205	3
5.	No. 16 " long "	360	4
6.	No. 17 " " "	233	4
7.	No. 2 " " "	392	4
8.	No. 6 " short "	300	4
9.	No. 8)		
	and 9) " " "	330	4
		<u>2240</u>	<u>32</u>

This course would have the intimacy of the present north short course, yet it would be 600 yards longer and have better golfing. It will be easy to combine holes 8 and 9 by using number 8 tee and number 9 green.

Estimated Budget for 1936	\$12,800
Daily playing capacity (foursomes)	550 rounds
Daily maintenance capacity	180 "
Average daily play should be	140 "

In this plan the problem of protecting the
Wilmington Highway involves only one hole, number 2

PLAN III. Reduction of Areas

If only one 18 hole course is to be maintained,
it should be at least 6000 yards long and have a par of
not less than 71.

There are several possible ways of combining
holes of each of the two long courses, or the 18 hole
course suggested for Plan II could be used.

Estimated Budget for 1936	\$9,000
Daily playing capacity (foursomes)	300 rounds
Daily maintenance capacity	140 "
Average daily play should be	85 "

The above budget is approximately the same for
any possible eighteen hole combination. The foreman
should be capable and have had technical training in
turf management.

Suggested 18 Hole Course

	Play hole				Yardage	Par
1.	No. 1	North	long	course	367	4
2.	No. 1	South	"	"	408	4
3.	No. 2	"	"	"	206	3
4.	No. 3	"	"	"	559	5
5.	No. 4	"	"	"	165	3
6.	No. 5	"	"	"	528	5
7.	No. 13	"	"	"	458	5
8.	No. 14	"	"	"	188	3
9.	No. 15	"	"	"	559	5
					<u>3438</u>	<u>37</u>
10.	No. 16	"	"	"	346	4
11.	No. 17	"	"	"	227	3
12.	No. 18	"	"	"	418	4
13.	No. 2	North	"	"	392	4
14.	No. 3	"	"	"	407	4
15.	No. 15	"	"	"	162	3
16.	No. 16	"	"	"	360	4
17.	No. 17	"	"	"	233	4
18.	No. 18	"	"	"	350	4
					<u>2895</u>	<u>34</u>
Total yardage					6333	par 71

On this course play would always be reasonably close to the golfhouse and it avoids playing across the Wilmington Highway, but protection for the highway would be needed from sliced balls on holes two and three.

From my study of the golfing possibilities at the Lake Placid Club, it appears that the adoption and operation of Plan I will produce better golf courses, encourage more play, and strengthen the recreational and social position of golf among the club activities.

It appears to be unwise to permit golf to submerge the other club activities, but it must be admitted that pleasant golfing will have a very attractive and strong hold upon club members and visitors.

The statement "average daily play should be" that appears under each plan, indicates the amount of play necessary to make the operation of the courses sociably and financially successful. If daily play could be maintained at the stated number of rounds the golfing factory would be making money for the Company; and enjoyment for all.

Handicapping

The number of entries in tournaments should be increased or the tournaments stopped. There is little fun or glory in winning a tournament in which only a few people participate. The overhead cost at your club for a tournament of 100 players is not much greater than for one having 18 players.

There should be more tournaments for the women players and team matches arranged between the club players; for example, the doctors vs. lawyers. The

matches could be run with or without handicaps, and I am certain they would create much enthusiasm.

The first move to increase tournament play is to change the present method of handicapping and to pacify the resentment that I found toward the present system.

The handicapping should be under the direction of the golf professional and made from attested scores according to the rules of the United States Golf Association.

It was uncertain handicapping that kept a number of golfers from entering the tournaments held during my stay at the club.

"Free" Golf

From a study of the activities of the club it appears that golfing as an attraction is being neglected. Golf, as it is being financed, is too expensive for the members and guests, either in actual cash or in value received. There is general hesitancy to play golf that permits the would-be player to be easily enticed to some other pleasurable activity

supplied by the club that is "free" or costs much less than golf.

The following opportunities are furnished by the club without extra charge, or as the recipient feels,--free.

Splendid symphony concerts; dances, special dances with valuable prizes; instructive lectures; use of swimming facilities; use of tennis courts; and many other enjoyable features that cost the club a considerable amount of money to produce and maintain.

The cost of all these very desirable contributions to the enjoyment of members and guests is included in the day rate charged. Every one pays whether they attend the concerts or use the tennis courts.

The following is a suggestion to bring about a uniform distribution of the golfing cost and to encourage more golfing.

Proposed Schedule for "Free" Golf
Based on Plan I.

Budget amount to be raised		\$19,000
Number of days in golf season		140
Expected daily number of members and guests (over 12 years of age)		500
Total number of hotel days	500 x 140	70,000
Necessary addition to daily rates		.25
Total expected receipts collected		\$17,500

Under this system each club member or guest would be entitled to one free round of golf daily while in residence at the club. If a second round is desired there should be a nominal greens fee charged, of not less than \$1.00 or more than \$1.50. Members and guests coming for a single day of golf would pay the regular greens fees as now established. There is little doubt but that \$1,500 could be obtained from the extra charges and day play.

A "free" round of golf each day on a very delightful course that is in good cultural condition should have a strong appeal to the vacationist. Under the proposed plan, a family of six persons would be paying \$1.50 per day for golfing, and each member could play without extra charge. Today one person can purchase 10 tickets for \$15.00. If the family is in residence 10 days, the total cash outlay for golf would be the same, but if in residence only 7 days the proposed schedule would effect a considerable saving in cash for the member, as well as permitting the whole family to play.

Golf is a game for the family, and the club has a great opportunity to help draw the family together

by encouraging family playing.

If such a proposed plan for financing the golf course is adopted, any surplus collected above the stipulated maintenance budget should be used to purchase golf course equipment and fertilizer that cannot be justly included in a maintenance budget until the cultural and physical conditions of the courses have reached a higher standard.

Budgeting and Record Keeping

My long experience in trying to assist golf clubs to obtain better golfing has convinced me that many opportunities are lost, and actual damage caused to the cultural condition of the golf course by uncertainty as to financial support, and indecision in expending appropriated money. A putting green can easily be severely damaged by disease while the red tape of a purchasing department is being unraveled, or while an inexperienced treasurer is trying to decide whether the greenkeeper's requisition for \$50.00 worth of fungicides should be approved.

It is a fact that a trained greenkeeper can

accomplish at least one-third more with a free hand within a stipulated budget, than he can with the same amount doled out to him in uncertain allotments.

To be sure, the larger the budget the better should be the playing conditions, but there is a top limit as well as a minimum limit, and a reasonable budget is better for the course than a liberal one. The value of a budget for golf course maintenance is not as much its size, as in its definiteness.

The courses can be maintained by the budgets suggested under the various plans, if the expenditures for 1932-'33 and '34 were reported to me correctly. The budgets are for normal maintenance only, and I am certain if expended wisely there will be a noticeable improvement in the playing condition of the courses. The improvement would not be of a radical nature but along those fundamental lines that would influence future maintenance.

The size of the budget for golfing should obviously be determined by the Board of Directors; acting upon the recommendations of the golf finance officer, after consultation with the golf manager; or the chairman of the greens committee and greenkeeper in

the case of a private club. Just as obviously, the divisioning of the budget should be left with the golf manager, and no judgment upon the success of the plan, or manager should be passed until a full year from date of starting the actual operation of the plan.

Any budget should be divisioned for the first time as previously outlined. There should be 20% of the budget held in reserve as an emergency fund until September 1, after which time it can be safely drawn upon.

There should be a distinct understanding that should there be an unexpended balance at the end of the fiscal year, it should not revert to the company's treasury to help a department showing a deficit; and that the balance should not influence the size of the next budget. Any balance should be held in trust for the purchasing of necessary equipment, or the erection of a much desired feature.

Items purchased within the budget should have their requisition approved without question by the financial officer.

Having once appropriated a budget for golf it should not be changed, and the expenditures should not

exceed the budget. These stipulations should be followed very strictly.

In the maintenance of a golf course it is more necessary to keep a record of events and distribution of costs than in business where all factors are tangible and the product definite. The golf manager (greenkeeper of private clubs) should keep such records and their meaning should be correctly interpreted. Inasmuch as the records of golf course maintenance operations that have been kept at the Lake Placid Club are incomplete and jumbled, during 1936 there should be a very complete and reasonably accurate record kept of events and each detail of maintenance activity. If a golf manager is not employed, the greenkeepers, or foremen, should be instructed to record these items in detail as well as an accurate distribution of labor hours. At present, these facts are not accurately or adequately recorded.

The management should understand that the keeping of detail costs is not primarily for the purpose of reducing total maintenance budgets, but is to obtain information whereby the cost of materials and labor hours can be reduced for a single operation, thus

releasing money and labor hours to other important work, or to do some extra work that will make the course more enjoyable. Proper cost record-keeping will discover unnecessary expenditures that have become chronic through years of unwatchfulness.

Fairway Watering

The minutes of the meetings of the golf committee have referred to the possibility of installing a fairway watering system; probably to cure all course troubles. The matter was given serious enough attention to have estimates of cost of installation submitted. \$14,685 for eighteen fairways.

Fairway watering is discussed in this report for the purpose of attempting to stop any further consideration of the subject on the part of the club until 1941, at the earliest. Through the courtesy of Mr. Smith, observer, I examined the records of rainfall at Lake Placid and talked with the "natives" concerning rainfall.

The normal rainfall is ample to grow satisfactory fairway turf. There are many unconsidered costs that

accompany fairway watering; for example, 12% - 20% increase in mowing costs. It is doubtful if there has ever been any grass on your fairways killed from drouth; it may have turned brown and become slippery and dry, but it all came back in the early fall. In a dry year, good cultural practice would require not more than five complete waterings and perhaps eight local area waterings. By require, I mean enough water to keep the grass green. Fairway watering would in all probability increase winter injury due to poor drainage and snowmold, unless expensive fairway alterations were made.

The annual cost of the system would be not less than \$1472.80 divided as follows: Interest at 3%, 438.55 operation and extra fertilizer and mowing \$200. Return of principal in 20 years- \$734.25. This cost would be much higher if the club did not own its quota supply and was forced to purchase the water.

It is my recommendation that the subject of fairway watering be ruled out of committee discussions.

Abandoned Golfing Areas

The questions of what to do with an abandoned course, and if it could be restored to playing condition without much effort are answered as follows.

The turf on the greens could not be easily restored to a putting surface after one year of neglect. Therefore, at the abandoning of a course, each putting green becomes a turf nursery and should be treated as such.

If the south short course is to be abandoned in 1936 there will become available over 35,000 square feet of turf for use on greens and tees.

No patching of the retained greens should be done without correcting the surface drainage of the green to reduce possible winter injury to the turf. As most of the patching will have to be done in the spring, the greens to be abandoned should be mowed as usual in the fall and in the following spring until the turf is removed. Only velvet bent should be taken for patching greens; the remainder of the turf can be used on tees or approaches.

In order to prevent weed infestations after

the sod has been removed, the abandoned green should be either prepared for nursery use, or seeded to red top at the rate of 2 pounds per 1000 square feet. The red top will remain for several years if clipped as hay.

I suggest that greens 1, 2, 3, 4, 8, and 9 be used for patching early next spring and that they be sown to red top. Greens 5, 6, and 7 should be kept fertilized and clipped for summer patching and for use in the spring of 1937. These latter greens should be kept as nursery areas and seeded to either velvet or colonial bent as fast as the turf is removed. Should any greens be abandoned on the other courses, the turf should be salvaged, the velvet bent going onto retained greens and the remainder of the turf onto tees or approaches.

The abandoned fairways should be treated as hay fields and they can be returned to golfing in three months by careful clipping and fertilizing. If an increasing amount of play seemed to warrant restoring the abandoned holes, the decision should be made before August 15 and the greens seeded at once. The fairways should be cut as closely as possible with a cutter bar

machine, and in the spring brought to playing height by a series of clippings with the fairway mowers starting with the knife set high and lowered 1/4 inch to 1/2 inch at such subsequent clippings until the desired height for fairway turf is reached.

The fairways would be playable by June 1 and the greens by August 1.

In several of the abandoned fairways there will be found large stands of velvet bent from which seed can be collected. If a part or whole of the north long course is abandoned the greens and fairways should be managed as suggested for the south short course.

Labor

Unless more area than the south short course is abandoned, there should be no reduction in the number of laborers, and the 19 men plus the mechanic should be enough to care for the two long courses, the north short course, and the Agora areas. If one 18 hole course and the north short course are retained there should be the foreman, eleven laborers,

and a mechanic.

The normal eight hour work day is in accordance with general golf course maintenance, but the absolute restriction of labor to eight hours in one day is unusual, and unwise. The work day can stop at 4 o'clock, but if efficient management and the cultural condition of the course requires the men to work overtime, they should do so and receive pay at the regular hourly rate. This is important for the efficient management of the course, and for the morale of the men. It is the first step to take to obtain the full value of a laborer's ability, and creates in him an interest in his work by making him realize it is important, and that he has an important part to do.

Not all work done out of the standard hours of labor need be extra time. Days in which heavy play is expected the men could start at 6 A.M. and stop at 3 P.M., or some could start at 5 A.M. and others at 12 noon. By so doing there would be much less loss of time from player hold up. Player hold up for one laborer can be as high as 40% of the working day.

Important cultural operations, such as top dressing of a green, are frequently more efficiently

and better done if there is no time clock to stop the work, than if the work stops at four o'clock regardless of the effect upon the efficiency of the work and the health of the turf.

The laborers should be permitted and encouraged to develop their Yankee ingenuity; they should not be permitted to lapse into mechanical or routine methods.

If Plan I is adopted, the total number of greensmen (or mowers of greens) should be increased to 10 and the greens should be mowed each day except Sunday or when the growth of grass is very light. Daily mowing of all greens will make them faster to play upon and more comparable to the greens of the "home course". It will also eliminate the condition as found this year; half the greens being faster than the other half because they had been mowed and the others not.

There should be no stipulated time when the greensmen should finish the poling and mowing, but on days that top dressing or an important job requiring the concentration of several men, I suggest that the lunch hour be from 11-12 to permit a longer, and, therefore, more efficient afternoon. A greensman should

find no great difficulty in having four greens mowed by eleven o'clock. There appears to be much unproductive time expended in mowing the greens, especially on the south courses.

During periods of stormy weather the men should not be sent home after the necessary routine work is finished, but should be set at some of the many jobs that can be done to a good advantage during bad weather. The men should not be permitted to run to cover at the first drop of rain. The mixing of fertilizer, screening of compost under a shed, repairing and cleaning of tools are all worthwhile rainy day jobs. Also, a man to patrol ditches, drains and roads during a storm is advisable. These possible wet weather jobs are noted because they are not being done at Lake Placid Club, and they have been found to be necessary to the efficient management of other clubs.

Observations convince me that the present method of utilizing the laborers time relies too much upon the routine work, and if the routine work is finished, the men are weeding greens because there is apparently nothing else to do. This method of weeding is expensive and usually not efficient on greens having

many weeds.

The greensmen should be instructed to pull from 10 - 15 isolated weeds or small chickweed or thyme patches as they mow each day, stopping to pull them wherever they appear. Aimless wandering about a green in search of weeds is very costly in time and morale. When it is advisable to really weed a green, mobilize the men and work on one green, using string marked lines to guide the men and having top dressing material on hand to fill the scars. Women are more proficient at weeding than men, therefore, a better method is to hire from 10 - 15 women with a man to direct and assist them. Such a group should be kept as a unit and on one green until all weeds are eradicated.

A greenkeeper or golf manager thoroughly familiar with golf course work would make many other changes from the present work schedule, the details of which are too numerous to mention in this study.

Equipment

The equipment functions, and does the

apparently necessary work because the mechanic keeps it in repair; and the system of maintenance has not experienced the economy of the modern types. Very few golf courses can boast of as many museum pieces of golf course equipment as are used at the Lake Placid Club.

Regardless of the size of the golfing plant retained, there must be a program planned for the replacement of equipment.

The following is a list of major equipment needed for the efficient operation of the golfing areas if either Plan I or II is adopted. The items are in the order of their importance.

<u>Item</u>	<u>Approximate Cost</u>
1. Rotary soil screen	\$ 300.
2. Soil shredder	300.
3. Two, combination tractor and dump trucks, rubber tired	1200.
4. Grinder for mowers	150.
5. 6 Putting green mowers (not lowest priced)	240.
6. 1 Extra unit for each fairway gang (2)	180.
7. 1 Spike roller for greens	135.
8. 8 Green sprinklers	80.
9. 1 Power sprayer for fungicide application	400.
10. 1 Light delivery body truck for golf manager	600.
11. Tank for the emersion of the mowers in an oakite solution	50.

If Plan III is adopted omit one tractor, 2 putting green mowers, 1 extra fairway unit, 4 sprinklers. Item 4 should be placed last, and the mechanic retained. Items 8 and 9 could be omitted.

Power to operate the soil screen and shredder could be obtained from one of the Fordson tractors now in use. I cannot urge you too strongly to include these pieces of equipment in your 1936 budget. The present method of handling the small amount of top dressing used is much too expensive and wasteful.

Fordson or similar heavy type tractors have been found to be too heavy and slow for hauling fairway cutting units. Lighter tractors equipped with rubber tires and a cubic yard dump body will mow more rapidly, and require much less gasoline and oil than the heavy tractors now in use. The best made tractors have ample power to haul five cutting units anywhere on the courses. The rubber tires will cause less injury to the turf than steel wheels, and the motors are very quiet in operation, therefore causing less annoyance to the players. The dump body could be used for hauling compost, grass clippings from the greens and many other jobs now being hauled by the ancient flat body truck. A golf club cannot

afford to shovel compost or similar material both on and off a vehicle.

A power driven lawn mower grinder would save labor hours, and machine wear enough to pay for itself in one season; if Plan I is adopted. Dull mowers often are the primary cause of serious turf trouble, especially to young grass.

There are only 2 sturdy putting green mowers of the high frequency of cut type. The higher the frequency of cut the smoother the grass and the better the putting surface. The lower frequency, light weight, and low-priced putting green mowers are one of the reasons for the slowness of the greens, because the sharp ribbing of the grass causes an increase in the resistance of the grass to a rolling ball. The high wheeled machines can be used on the Agora lawn and tees. By frequency in lawn mowers, it is meant the number of reel blades that pass over the bed knife while the machine moves forward 31.4 inches. Each cut causes a rib to form in the grass, and the closer together the ribs are the smoother the turf is.

The removal of a single unit from a five gang hitch reduces the efficiency of the gang from 24% - 30%.

It is very frequently necessary to repair a unit or sharpen a knife that has hit a stone. Without a spare unit to use, the mowing unit is often operating at a great loss of mowing time and power efficiency. The average cutting unit is out for repairs 5% of the total mowing time for the season. Therefore, at least 25% of the time, the fairway five gang mowers are operating at an efficiency of 30% or less. The sound business in purchasing a spare cutting unit for each five gang mowers is obvious.

New type sprinklers are needed to obtain a greater coverage of area at one setting and a more rapid and even distribution of the water.

Fungicides and weedicides are applied more effectually from a high pressure sprayer than by any other way. The cost is much less in labor hours and material, and the control of the disease more effective.

Both Fordsons should be saved as their power as stationary engines is useful, and they could be used for plowing and harrowing.

The old flat body truck should also be retained and fitted to carry pipe for the installation of the water system each spring and during the summer

for general hauling. The turn-in value of these machines is very low, but their worth to the club is great, as auxiliary equipment.

Immediately after disconnecting and draining the water system in the fall, the mechanic and the greenkeeper or golf manager should start cleaning, repairing, and sharpening all mowers, and overhauling all machinery needing attention. The present system of not repairing the mowers until after the water system is connected in the spring should be reversed; if the above suggestion is not followed, as the mowers are more important than the water.

All hose purchased in the future should be 3/4 inch size, and there should be a full supply of new small tools purchased before next spring. Badly worn tools are not efficient.

The machine shop should be heated to permit work during cold weather.

The large empty shed east of the service buildings is an ideal place for the storage of loam and compost material.

The service buildings should be wired for electric lights and power, and the present gasoline

motors replaced by electric motors.

Shelter and Communication Lines

For player convenience I suggest that if Plans I or II are adopted that a local telephone line be established between the half way houses on each long course and the golfhouse. The distances to the golfhouse are too far to walk, for an elderly man who suddenly finds himself over tired at the end of nine holes of golf; or, in case of a prolonged storm the player could arrange for transportation. If this telephone line was also connected with the service buildings, as it should be, it would be of great assistance in the management of the labor and would enable the maintenance department to render quicker and better service to the golfhouse.

The shelters for players are not all well built for complete protection. A golf shelter must offer protection from wind and blowing rain from any direction, yet the shelter should have light and be well ventilated. A very satisfactory type is a mushroom shelter divided by cross partitions set at

right angles. Each of the long courses should have one more shelter house.

The roadway on club property from the golfhouse to the lower courses should be repaired to save many miles of club and player travel each year, and to encourage more play on the lower courses by making the first tee more easily accessible.

Policing and Counting

The present method of policing the course to apprehend trespassers and to be of assistance to the players is splendid and should be continued under the personal direction of Mr. Dowling.

The system of player count is not accurate, but perhaps satisfactory and sufficiently strict enough to be in keeping with the club spirit.

Parking About the Golfhouse

The automobile entrance to the golfhouse has not been fully developed. No radical change is suggested as the informality and woods atmosphere add much to the

attractiveness. There should be a space cleared for parking automobiles on the west side of the main drive, and a wide circular drive constructed west of the house to permit cars to discharge passengers at either end of the building.

Women's Tees

To meet the requirements of a possible increase in play and to encourage women to play golf, women's tees should be built on all holes requiring them in the opinion of Mr. Searles and in conformity with the rules of the U. S. G. A. While the erection of women's tees is very important they should not take precedent over new equipment or fairway improvement. There are a few holes that have too long a carry from the men's tee to the fairway for the average women player. I suggest that on these holes, small temporary earth tees be erected during this late fall or early winter. The expense would not be large and the women will appreciate the thoughtfulness of the committee. The courses should be rated and carded with women's par and all women's tournaments and handicaps arranged

according to the U. S. G. A. rules for women's play. This is an inexpensive improvement that should be included in the 1936 plan.

Protection of the Wilmington Highway

Before holes 2 and 3 of the north long course are opened for play in 1936, there should be a screen erected along the Wilmington highway to prevent poorly hit balls from tees number 2 or 3 striking passing automobiles. Failure to erect such a screen constitutes criminal negligence upon the part of the club. Because there have been but a few minor accidents in the past and none of the influential golfers have had a scare on these holes, is no security that 1936 will also be free of accidents. There are many court records of accidents that have happened under similar conditions that have caused great financial embarrassment to both the player hitting the ball and to the golf club owning the course.

Screening of highways has been done by many clubs and offers no particular difficulty. The screens should be at least 30 feet high and preferably

40 feet. They need not protect the entire length of the highway from opposite number 2 tee to the base of the hill in number 3 fairway, but they should be located so as to catch any sliced ball that is liable to be hit from either tee number 2 or 3. At a speed of 40 miles per hour, automobiles on the highway remain not more than 20 seconds in the danger zone; therefore, it is particularly necessary to protect against the slicing by the long hitting player who, believing it safe to play, addresses the ball, hits, and suddenly finds that the ball is being driven toward a fast approaching automobile that came into view while the ball was being addressed, or after it was hit. A short hit ball under similar conditions would probably strike the ground or cross the highway before the car could intercept its flight.

The screens should be constructed with heavy duty chicken mesh, poultry fencing or a similar material having a mesh small enough to stop a golf ball. The screening should be attached to securely braced wooden or iron poles. Because of the storms that occur each winter, it is advisable to make the screens in such a

manner that the wire can be removed from the poles after the play stops in the fall. The removal of the wire during the winter is necessary to avoid the possibility of complete destruction of the screen by snow, wind, and ice. The judgment of local men as to whether the screen can withstand the weather or not should be considered.

With the erection of the screen a local rule would have to be made about balls hitting the screen.

There should be a notice posted at the golf-house that it is the rule of the club to have a caddy posted on the Wilmington highway while a player is teeing from either tee number 4 or 5 and while any shot is to be made across the highway. The caddy is to warn the player if it is unsafe to drive or play. A threat (it is doubtful if it could be legally enforced) that the club would assume no responsibility for an accident caused by failure to conform to the rule, would make the players appreciate the seriousness of the danger. The attitude of the players concerning the highway, as observed by me, is very careless and thoughtless. It is my opinion that the erection of these fences should take priority over the purchase of equipment if available funds are low.

The screen would not interfere with play as the highway is out of bounds at present. It would save many balls from being lost and reduce the mental hazard for the player.

Turf Nursery

All turf nurseries now in existence should be abandoned after salvaging the small amount of good turf they contain. They are too small, poorly located and not well established.

The use of greens 5, 6, and 7 of the south short course for permanent turf nurseries has already been discussed, and by chance the total area of these greens is approximately 15000 square feet, which is the estimated correct size needed for the greens of the courses under Plan I.

A tee and fairway nursery should be made from the better portions of fairways 6 and 7 of the south short course. The minimum size desirable is 4000 square feet for the tees and 2000 square feet for the fairways. Adequate turf nurseries are absolutely essential and should not be omitted from the 1936 program.

In general, the management of the putting turf nurseries should be as follows: beginning at once, all repair patches should be taken from the greens to be abandoned; the velvet bent to be used on the greens, and the coarser bent on the tees. An effort should be made to use all the turf before mid May, 1936, to avoid the expense of clipping the grass before mowing it. One green should be completely stripped before cutting into another, and untouched greens should be kept clipped at putting green height until used.

The permanent nurseries (greens 5, 6, and 7, south short course) should be fertilized as the regular greens but need not be clipped or top dressed as frequently.

There is enough velvet bent in greens number 1, 2, 3, 4, 8, and 9 of the south short course to provide enough patching turf until June 1, 1936. Green number 5 will supply enough turf for the period June 1 until fall, leaving greens 6 and 7 for use in 1937.

As turf is stripped from the nursery the bared area should be seeded with velvet bent seed obtained from the large areas of this grass in rough on the south long

course. The correct rate of seeding home grown bent seed is 6 lbs. per 1000 square feet of area to be seeded.

The tee and fairway nurseries should also be clipped with the fairway mower each time the regular fairways are mowed and re-seeded as fast as the sod is stripped from a reasonable sized area. The nursery should be kept well fertilized so as to assure healthy plants capable of withstanding the shock of transplanting.

Seed for the fairway and tee nursery should be a mixture of Chewing's New Zealand fescue 4 parts, Colonial bent 1 part, Cocos or Oregon creeping bent (*Agrostis stolonifera*) 1 part, Red top 1 part. Parts are by weight and the rate of seeding is 4 lbs. of the mixture per 1000 square feet for fairways and 5 lbs. for tees.

Winter Injury to Turf

As previously indicated, there are two causes for winter injury to the turf; one the fungus *Fusarium nivale* commonly called snowmold, and the other poor drainage.

The snowmold can be reasonably controlled by treating the greens in October with 2 ounces of bichloride of mercury per 1000 square feet. This treatment should be made annually as a part of the late fall work.

The most important factor causing the unusual amount of winter injury to all turf in 1933-1934 was slow surface drainage, which caused a backing up of surface water from a dam formed by ice after a thaw. While all species of grasses were injured, it should be noted that the velvet bent was less injured and its recovery was quicker than the other grasses. It is generally conceded that in New York and New England velvet bent was the least effected by winter injury of any of the fine turf grasses.

Two fundamental corrections must be made upon the greens before the danger of winter injury is reduced to an unimportant factor. The sod must be lifted from the outlets of the surface drainage area and enough soil removed to assure a more rapid run-off of surface water.

In removing the dams the men should be directed to open wide areas to avoid sharp sloped hollows which are difficult to mow without scalping, and to go off the green far enough to assure the free flow of water.

The greens in special need of regrading will be listed later in the study. In the spring of 1934 during the examination of over 150 greens, I did not find one green with winter injury if the surface run-off was free and the sub drainage good; also courses that lowered the outlets in 1934 reported no injury in the spring of 1935.

If the surface drainage cannot be corrected in the fall, temporary drainage should be provided by cutting a shallow ditch through the dam. The ditch need not be over six inches wide, and the lifted sod will not be seriously injured if it remains flat and grass side up during the winter.

The same principle applies to the fairways but in some sections the operation would be rather expensive. However, there are a number of locations that can easily be easily drained of the surface water by plowing a furrow or digging a shallow open ditch through the dam. Digging would be much better, as the sod could be lifted by the shovels and easily replaced in the spring. These ditches

can be dug after play stops in the fall and can be filled and sodded early enough in the spring to avoid interference with the playing of the course. I am sure the fairways requiring surface draining will be greatly benefited if drained. Each year a certain amount of drainage should be permanently corrected.

A few greens on the north courses need sub-draining. In each case, the type of drain required is an intercepting or isolating drain, laid to prevent soil water from entering under the green. This type of drain is most effective if laid at right angles to the flow of water and constructed off the green. The starting depth should be not less than 2 feet, and the minimum grade should be 6 inches in 100 feet. Four inch land tile should be used and the upper half of the joints covered with tarred paper. The trench should be back filled with coarse gravel or broken stone to within twelve inches of the top, leaving twelve inches for soil and sod. If possible, the elevation of the bottom of the drain should be below the elevation of the lowest point on the area to be drained. Green number 10 of the north long course should be the first green to be drained in this manner, and number 14 of the same

course should be the second.

The principal source of soil water is number 10 green, the wooded area back of the right side of the green from the sloping fairway in front of the green. An intercepting drain should start at a point approximately one-third of the distance from the left front corner to the right front corner, and three feet in the fairway. From this point it should extend to the right to a point at least 3 feet beyond the right corner of the green; it should then turn and parallel the right side of the green to the right rear corner, where it should turn to the left and outlet in the woods back of the center of the green. The depth of the trench at the first turn should be 3 feet. It will be necessary to dig about 100 yards into the woods to reach an outlet.

Green number 14 can be much more easily drained. The intercepting drain can either start off the green near the left front corner and run parallel to the left side of the green, turning around the back to an outlet down the slope in the fairway at the right rear of the green, or it can start opposite the left rear corner and run forward and parallel to the left side of the green and outlet in the fairway in front of and at the left of the

green. The latter will require less digging.

General Treatment of Fairways

Fertilizer and re-seeding are the principal requirements of the fairways. On the flat and moist fairways, seed with a mixture of 4 parts Colonial bent and 1 part of red top. Parts by weight and the rate of seeding to be 120 lbs. per acre. On the drier area use the mixture suggested for the fairway and tee nursery.

The experiment tried for the rehabilitation of number 12 fairway on the lower long course and on other areas was well worth trying but it very obviously failed to bring satisfactory results. It is my suggestion that during 1936 and 1937 there be no harrowing or tearing of the fairways and that fertilizer be applied the spring of both years. Experience has proven that it is better to feed existing grass than to tear it up, re-seed, and run the great risk of weed infestation and continued poor turf because of failure to correct the fundamental trouble.

I have repeatedly demonstrated that a general

broadcasting of seed over the poorer areas will waste more than 85% of the seed sown. However, bare areas should be raked and re-seeded providing the fundamental reason for the bare spot is first corrected.

The program for 1936 should assure the fertilizing of 30 yards of each approach area to the green and a 75 yard ball landing area for tee and second shots.

The fairways should be rolled in the spring, but not before they are dry. When the roller is wet from the soil it is too wet to roll. The soil must be friable but not dry. Obviously/^{not}all fairways, and often not all of one fairway, can be rolled at the same time, and it is better turf culture not to roll the turf at all if the rolling cannot be done at a time when the soil is in the correct physical condition for rolling.

Approach Areas

In this study the area from 25 to 30 yards in front of a green is considered the approach area.

Fertilizer alone cannot assure good turf in these areas. The surface drainage must be corrected in

these areas as well as on the greens, and the areas that have been patched with weedy turf or seeded must be re-seeded with the regular fairway mixture in the spring.

The method of removing the surface water from the approach areas is similar to that suggested for the putting greens; namely, remove the sod and scoop out a broad and shallow drain to a convenient outlet. If the drain is more than 3 inches deep, the top soil should be removed and the sub-soil excavated to a depth that will give the correct grade after six inches of top soil and the sod have been replaced.

Care must be taken to remove the clippings from the approaches during the periods the annual blue grass is in seed. Much seed can be tracked onto the green by players if this precaution is not taken. The easiest way is to attach grass catchers to the mowers.

The immediate approaches (3 yds. in front of the green) should be clipped at least twice a week with one of the high wheeled mowers set at $3/4$ inch.

Use of Native Velvet Bent

All areas of native velvet bent in the rough should be permitted to develop seed and the seed should be harvested by scything and raking up the seed heads. The clipped seed heads should be raked immediately and carried to a shed and spread to dry, or they can be dried in the field as hay. To avoid wasting much seed, harvest while the seed appears a bit green, as the seed will ripen if left on the stem after the grass has been cut. If there is a seed bed prepared at the time of harvest, the seed heads can be scattered thickly over the area and very lightly top dressed with soil. However, it is better to dry the seed heads in a shed, shake the seed out and sow. The shaking of the seed is a good job for a wet day. The strain of velvet bent that is growing wild on the courses is so hardy and fine textured it will pay to harvest every bit of it. Both north and south courses have large areas available for harvesting.

I suggest that a small area in the turf nursery be planted with stolons of this bent to determine if it can be more rapidly propagated by this

method. One square foot of sod pulled apart for stolon planting should cover 6 to 8 square feet of nursery soil.

Weed Control

Dandelion (*Taraxicum officinale*) in the fairways.

At the time the dandelions are in bud or early bloom, spray or sprinkle the thickly infested areas with a solution of iron sulphate cooperus made by dissolving 1 1/2 lbs. of iron sulphate into 1 gallon of water spread as to cover about 300 to 325 square feet of area.⁶ The area will turn blackish brown in color, but recovery will take place within 10 days. The spray should be applied during bright sunlight, and there should be no watering of the area for at least four hours after the application of the spray. Three days after applying the iron sulphate, fertilize with ammonium sulphate at the rate of 2 1/2 lbs. per 1000 square feet. On the tees and greens dig the dandelions out, making sure to remove at least 2/3 of the tap root.

Pearlwort on the greens.

Pearlwort (*Sagina procumbens*) must be dug or plugged out as chemical control is unsatisfactory because the weed has more resistance to chemicals than the grass has. All mowers working on greens having pearlwort should be thoroughly washed before working on another green, particularly when the pearlwort is in seed. This is a very bad weed to get into the greens because of its effect upon the putting quality of the turf, and there should be a definite campaign against the pest in 1936. The plugs should be cut at least 1/2 inch beyond the visible plant, as propagation is underground root stocks as well as by seed.

Lawn Pennyworth (*Cobolusia virginica*) in the greens.

On the upper courses. For the present do not put special effort on the removal of this weed. Its presence usually indicates the presence of seepage water near the surface. A dry season would probably cause this weed to disappear.

Mouse-ear chickweed (*Cerastium vulgatum*) in the greens.

Dust the patches while wet with dew with a liberal amount of arsenate of lead. This method should be tried on a few patches at first as it is not certain to be effective, and the chemical will not injure the grass. Scientific investigation is now being made to determine the cause of the uncertainty in results. If this method is not successful, the patches can be dusted with ammonium sulphate or scratched out with a fine-toothed rake.

Yarrow (*Achillea Millefolium*) in the greens.

It is a waste of time to attempt to eliminate this weed from the greens by any other method than correct cultural treatment for the grass.

Clover (*Trifolium repens*) in the greens.

During 1936 I suggest no special effort be made to eliminate the clover as there are many other more important jobs to do.

Probably the easiest method to eliminate clover from a putting green is to apply sodium chloride (common table salt) to the infested area, in two doses of 25 lbs. per 1000 square feet. The salt should be spread dry and then washed from the grass blades by a light watering. The second application should be made the following day.⁷

Disease Control

Because of the cool climate of the Adirondacks region, the excellent soil on the greens, and the correction of the extreme acid condition, there should be very little danger from fungus diseases attacking the greens. Large brown patch (*Rhizoctonia solani*), small brown patch or dollar spot (*Rhizoctonia* sp.), and snowmold are the only diseases likely to become active.

At Lake Placid the control of the brown patch diseases should be by daily early morning mowing of the greens and an application of the fungicide at the first appearance of the disease.⁸ I do not think it desirable or necessary to make periodic applications of a fungicide

for the purpose of preventing attacks of the diseases. Certainly, good business management does not warrant it.

The fungicides to use are Calomel and bichloride of mercury, both mercuric compounds, and deadly poisonous. As prompt action in making the applications is very necessary, you should purchase in the spring or this fall, if the price is down, an ample supply for the season. As experience can tell you the probable number of attacks to expect, the amount needed can easily be figured.

The maximum rate of application per 1000 square feet for large brown patch is Calomel, 2 ounces; and bichloride of mercury, 1 ounce; and for the small or dollar brown patch, 1 ounce, Calomel; 2 ounces bichloride of mercury. It is not necessary to change the formula for the control of the small brown patch, but I believe it desirable. If you do not care to purchase the chemicals there are commercial preparations of the same formula on the market. The chemicals are much less expensive.

Light attacks are effectively controlled by a two-thirds dose, and during periods of brown patch

weather, frequent applications at one third rate will usually effect a control. The fungicide can be applied in solution, 3 ounces in 50 gallons of water or the 3 ounces mixed thoroughly with a pail of dry sand and broadcasted over the green. If the broadcast contains the full 3 ounces, it should be washed in to avoid injury to the grass blades. If the application is by solution, do not make the mistake and wash the fungicide into the soil. It should be on the top of the soil and in the grass crowns. Frequently, an attack of large brown patch will start in the late afternoon following a thunder shower that did not cool the air. If so, the men should be expected to work overtime to apply the fungicide or pole the green, and the fungicide should be applied even if it inconveniences players. There should be no stimulating fertilizer applied during a "spell of brown patch weather" but 2 pounds of ammonium sulphate per 1000 square feet after "the spell" is over will help the grass to make a quicker recovery.

The thorough poling of the greens in the early morning should not be neglected as it will check any light attack of either of the brown patch diseases.

Suggestions for the Treatment
of Certain Putting Greens

Certain putting greens needing special attention are noted in this study. These greens should receive the special treatments suggested in addition to the general treatment for all greens.

NORTH LONG COURSE

Number 3. The chickweed on the bank at the rear is a source of contamination for the green. It should be removed before control is attempted on the green.

Number 4. Spike deeply and top dress with sharp sand the front section which is wet and wormy. Place an intercepting drain outside of the immediate approach to divert seepage water.

Number 5. A few feet of the front of this green could be added to the approach area to give a better immediate approach and to eliminate the thin and poor appearing front of the green.

Number 7. The water box cover should not be included in the green; in fact, it should be removed

from the immediate green area. It is a playing hazard.

Number 8. Remove spurge from narrow entrance and exit at left, fork deeply, incorporating sand and muck. (6 parts sand, 1 muck well mixed.)

Number 10. Drain as previously directed. This green has a large amount of pearlwort in it; use care in cleaning mower.

Number 11. Strip all turf from three feet off the green on the right to three feet in the green from the bottom of the slope. Destroy it as it is full of weeds. Resod with fairway or tee sod. The slope at the right should not be included in the green; it mars the design, adds to the cost of maintenance, and impairs the health of the grass.

Number 12. Intercepting drain needed across the front and shallow surface drain. Open a small space (8 feet long) in the cross bunker to permit a partial view of the green to gauge the distance better.

Number 13. Should be forked before the 1937 season.

Number 14. Drain as directed.

Number 16. This green may be very thinly grassed this fall. It should be thoroughly forked this

fall or very early in the spring.

Number 18. No practice putting should be permitted on this green. Fork and top dress with sand this fall. Plug out pearlwort this fall.

SOUTH LONG COURSE

Number 1. Lower outlet at left.

Number 2. Protect with brush during the winter.

Number 4. Lift sod and fill center to avoid a water pocket.

Number 6. Low section in front center should be filled in.

Number 18. Eliminate the sharp humps or strip the sod from them and work muck into the soil. Will need special spot fertilizing in 1936.

NORTH SHORT COURSE

Number 3. Explode one-third stick of 30% low power dynamite in each of several holes placed about ten feet apart in the low part of this green. The holes should be four feet deep and can be made with a crow bar or soil auger. If the dynamite is tamped firmly the surface of the green will not be affected by the explosion.

This should be done late this fall. The object is to crack the hard sub soil to permit better drainage of the sub soil.

Number 5. Dynamite or place an intercepting drain along right side.

Number 7. Place an intercepting drain from left rear to left front and then across front to natural outlet.

Number 9. Trench back of green and cut pine tree roots which are entering the green. Place creosoted matched plank in trench to prevent the roots from re-entering green.

The following greens are being more or less affected by seepage water. North long course- 1, 4, 10, 12, 13, 14. North short course- 3, 5, 7.

The following greens are in special need of having the surface water outlet lowered. North long course- 2, 6, 17. South long course- 1, 3, 7, 12, 13, 15.

Perforating the Greens

All greens will be benefited by an occasional spike rolling with an approved type of spiker. This is especially needed on the north courses, and will be more so as the velvet bent increases.

I have suggested forking several greens. By that I mean to use a five tine dung fork on greens needing forking only and a spading fork on greens requiring top-dressing in addition. A green is forked by inserting the fork at an angle of about 75° to the depth of the tines. Then bear down on the handle so as to slightly lift the sod. The fork rows should be about four inches apart. Where a top dressing is to be applied, the fork should be pushed down and then forward to lift the sod and leave a large fork hole for the dressing. Do not fork any more rows than can be top dressed without walking on the forked area.

If the forking is done in the fall the sod need not be rolled into place until spring. If done in the spring it should be firmed to a true surface within two weeks.

Top Dressing the Greens

While soil top dressing offers a splendid medium in which to carry fertilizer, it must be remembered that top dressing is primarily done to true the greens surface, to keep a constant supply of soil about the grass crowns and to correct the physical condition of the soil. If the top dressing time coincides with the fertilizer time, mix them and apply; otherwise, each operation should be independent of the other.

The greens, particularly on the south long course, have not been top dressed frequently or heavily enough. The program for 1936 should call for four liberal top dressings averaging at least a cubic yard for each 3000 square feet of area. The coarse stoloniferous grass on the south long greens should be brushed before top dressing, otherwise these greens will become even more grainy and higher tillering than they are now. Especially designed rake should be purchased to level and work the dressing among the crowns. More top dressing will cause the greens to be faster putting and will lessen the footprint depressions about the cup.

These footprints are a handicap to the player starting late in a tournament. In addition to the general top dressings there will probably be special areas, large and small, that should receive one or more light top dressing.

Two 18 and one 9 hole courses will require 325 cubic yards of top dressing in 1936. It should now be seen why the soil screen and shredder are placed first on the list of equipment needed.

Mowing Putting Greens

For the present, hand-operated machines should be used on all greens, and I believe always on the north courses. The greens of the south long course are well designed for the use of a power green mower and by using one, a careful operator could save a considerable amount of time and not injure the greens. A careless operator would save more money but seriously injure the greens. The mowing schedule has already been suggested in this study. During the season of 1936 the height of cut of the grass on the greens should be $\frac{3}{32}$ of an inch shorter than in 1935.

More frequent top dressing and shorter grass

will bring the greens to a condition more nearly like the home courses of the players, and the putting will be much more sensitive and require a greater amount of skill.

Winter Protection of the Putting Greens

Greens 7, 8, and 9 of the north long course and 1, 2, and 9 of the south long course should have a very light screen of brush placed on them in the late fall to help hold snow and prevent excessive drying of the soil. These greens are exposed to the sweeping winds which draw the moisture from the frozen soil. The brush should be removed before the snow melts in the early spring or not until after it has entirely disappeared. Removal between times would very likely cause severe snowmold under each footprint.

Seeding Time

From August 1 to September 15 is generally considered the most satisfactory seeding period in the north eastern states. It appears that on the whole, much

better results are obtained at Lake Placid if the seeding is done in the spring. That reason alone is sufficient to cause the club to plan to do most of the seeding in the spring.

Spring seeding does not mean that the ground cannot be prepared. Much valuable time can be saved by preparing the soil in the fall. Cut ditches, if necessary to prevent washing, but prepare the soil even to the finished grade, and sow the seed when the soil is in the honey-comb stage of freezing and thawing. If sown then, the seed need not be covered or rolled.

Tee Management and Notes

The tee program, as now being carried out, appears to be satisfactory and should be continued during 1936. The fertilizer program will be included under the item "Fertilizers."

Two tees need immediate attention. Number 2 of the north short course should be sodded. Before sodding, make certain that the soil has been loosened to a depth of eight inches and that there is a large amount of sand and some of the muck evenly mixed into the soil.

After completion the tee should feel soft.

Tee number 5 of the north long course cannot be expected to be good until several trees have been cut to permit more sunlight upon the tee. This tee should have a gravel base covered with eight inches of friable top soil. The tee should be trenched on all sides and the tree roots cut, as they are stealing much of the fertilizer.

Practice Putting Green

The cultural practice on this green should be exactly the same as on the regular greens. The surrounding trees should be trimmed to permit more light on the green, and careful watch should be kept to note any thieving of fertilizer by tree roots. The tree leaves should be kept raked from the green in the fall.

Agora Putting Lawn and Putting Course

The cultural practice on these areas is excellent, and I shall only suggest a fertilizer

program. The putting lawn must be watched for signs of becoming too compacted and overwatered.

Manural Compost

The top dressing soil will be improved by the addition of well rotted manure, but not sufficiently to warrant the purchasing of the manure, and the manure that can be obtained from the club farms has too many shavings in it to make it desirable for golf course use. There is a large pile of half rotted hay, grass clippings, and vegetable matter in a scattered unkempt pile west of the golf barns that should be utilized. The present unsightly pile should be made into regular and business-like piles and the material used.

The manural compost pile should be built as follows. For convenience, the size of each pile should be eight feet square and when first built, about 5 feet high, and located on the sight of the present heap.

On an eight inch layer of the hay, rotted or otherwise, throw 5 or 6 shovelfulls of soil, any soil, 8 lbs. of calcium cyanimid, 8 pounds of ammonium sulphate, 8 pounds of 16% superphosphate, and 4 pounds of muriate

of potash. Repeat these layers until the pile is about 5 feet high. It does not matter whether the material is rotted or not, as the dry material will decay rapidly. After a pile has been completed it should be soaked thoroughly until water oozes out. The piles should be turned over every four weeks until the material is well rotted. There will be sufficient heat generated to prevent freezing during the winter. After each turning the pile should be thoroughly soaked with water.

It should be the policy in the future to place all hay, grass clippings, and such material in a pile to make artificial manure. This manure can be mixed with the top soil as directed later in this study, or incorporated into the soil during the construction of new tees.

Top Dressing Soil

Very few golf clubs have as good top dressing as is found on the golf course of the Lake Placid Club. The existing top soil is almost ideal physically, and the available peat is nearly perfect. Furthermore, there is an enormous supply of each. These natural resources

should be utilized though the cost of preparation may appear to be high.

The abandoned polo field will furnish soil for many years, and the muck can be obtained from the swamp section of the club property.

There are two ways in which these materials can be mixed for the top dressing soil. Either should give excellent results and the choice should depend entirely upon local conditions. Best results will be obtained if two parts by bulk of soil are mixed with one part of muck, but an excellent top dressing will be had if the mixture is three parts soil and one part peat. In either method, all sod and clods can be used if a soil shredder is obtained, and the muck need not be entirely dry. Each method involves the use of the large shed, east of the work sheds, for storage.

Method 1. Haul to the shed soil and peat in the desired proportions and place them in parallel windrow piles, far enough apart to permit the working of the shredder between the rows. The materials can be hauled and dumped at any convenient time. The peat should be hauled first to give it more time to air dry. Artificial manure should be added to the prepared top

soil at an approximate ratio of 1 manure to 6 soil.

On stormy days and during the late fall run the soil and peat in the desired proportions through the shredder. The shredder will mix and pulverize the material and eject all large stones. The mix can remain in the pile until it is sufficiently air dried to permit screening. Screening loam is a profitable rainy day job, and by having the material kept under cover from the start there will always be on hand a supply of screened top dressing.

Method 2. Haul the peat to a windrow pile on the polo field, and shovel the soil directly from the field to the shredder. The mixed and shredded soil should immediately be hauled to the shed for dry storage and screening. It is very advisable to have the screening done under cover, and to have a large supply of screened soil on hand at all times.

By mixing the peat with the soil you will reduce the fertilizer requirements and increase the water holding capacity of the soil. I am certain that an investment in this top soil will pay large dividends. The soil can be used on all areas and, without screening, in the construction of tees.

Fertilizer Mixtures and Programs

Four possible fertilizer mixtures are suggested that can be compounded by the workmen, and one of them will include the 4-8-4 fertilizer on hand. Each mixture will give the desired result and the price of the total mix should be the governing factor as to which to purchase. There should be no substitutions in a mixture, for by so doing the balance of plant food would be disturbed.

For Greens and Tees

Mixture A

Milorganite	100 lbs.
Muriate of potash	10 lbs.
Ammonium sulphate	20 lbs.
Superphosphate 16%	<u>20 lbs.</u>
	150 lbs.

Mixture B

Cottonseed meal	100 lbs.
Muriate of potash	10 lbs.
Ammonium sulphate	10 lbs.
Animal tankage	<u>20 lbs.</u>
	140 lbs.

Mixture C

Dry brown Castor bean pomace	100 lbs.
Muriate of potash	10 lbs.
Ammonium sulphate	25 lbs.
Superphosphate 16%	<u>20 lbs.</u>
	155 lbs.

Using 4-8-4

4-8-4	100 lbs.
Muriate of potash	6 lbs.
Milorganite	<u>100 lbs.</u>
	206 lbs.

Rates of application per 1000 square feet at the full dosage.

Mixture A -- 15 lbs. B. -- 14 lbs. C. -- 15.5 lbs.
D. -- 20.5 lbs.

There is a slight preference for mixture A, and if applied at the full rate, each mixture but D should be washed into the soil.

For Fairways

Milorganite 100 lbs., Animal tankage 50 lbs., Muriate of potash 15 lbs. Mix and apply at the rate of 600 lbs. per acre.

There are several excellent commercial turf fertilizers having plant food ratios of 10-6-4 and 8-6-2. If the club should feel that the ready mixed fertilizers were to be less expensive, they are satisfactory to use, but 10 pounds of muriate of potash should be added to each 100 pounds of fertilizer in order to correct the present potash deficiency. The rate of application of these commercial brands would be 10 pounds for the 10-6-4, and 12 pounds for the 8-6-2 per 1000 square feet, and they should be washed into the soil.

There should be no fall fertilization of any turf areas as the stimulated growth would make the conditions more favorable for snowmold.

Tees, greens, and fairways should be fertilized at the start of the growing season, probably about May 1, with a full dosage. The tees and greens should receive a second application, but at two-thirds rate about June 1. If the second fertilizing is postponed beyond June 15, the application rate should be reduced to one-half of the full dosage.

If the peat is used in the top soil and the top dressing applied as often as suggested, only the spring application of fertilizer will be needed unless the grass shows actual signs of starvation.

CONCLUSION

The Lake Placid Company is now operating a golfing plant that is much larger than is required by the players or is justified as a business.

There is a potential golfing market for two eighteen and one nine hole courses, that can and should be developed.

The management of the courses in the past has been most satisfactory under the stress of economic depression, but the immediate management from now on must consider the fundamental scientific principles of fine turf growing and the accumulative effect of errors or correct practices.

The cause of the severe winter injury of 1933 was slow surface drainage, and that condition still exists but can be altered without undue expense.

Any architectural changes, except the erection of women's tees, are unnecessary and inadvisable.

To obtain improved conditions, there is no need for radical treatment of any area or the putting out of play of any tee or green. The unusually fine natural conditions, soil, climate and best of all, grass,

makes for a condition that if the management cooperates with nature, there can be assured pleasurable golf on a business basis.

The author fully realizes that he has made many statements, as facts; that from a purely scientific viewpoint, demand proof; either by a lengthy discussion or a reference to a scientific publication. He also realizes that he has failed to state all of the factors that influence the solution of a problem of golf course maintenance, and that he has not stated all of the possible solutions to the particular problem studied.

The object of this thesis has not been too expound well known scientific facts and show their relationship to the problems nor to furnish a scientifically complete list of directions for the cultural management of a golf course. However, it should be understood that the expert in golf course management is conscious of these scientific facts which enable him to make a diagnosis of the problem, and to offer correct advice as to its solution.

Complete scientific knowledge is of little value if it is not used in an efficient manner. Therefore, the knowledge of a method for the study of a problem is as important as the knowledge of the scientific principles involved.

In this study of a specific golf course problem, there is illustrated a practical method, any part of which is scientifically correct, yet easily explained to the layman.

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by the stud

Rendition Chart